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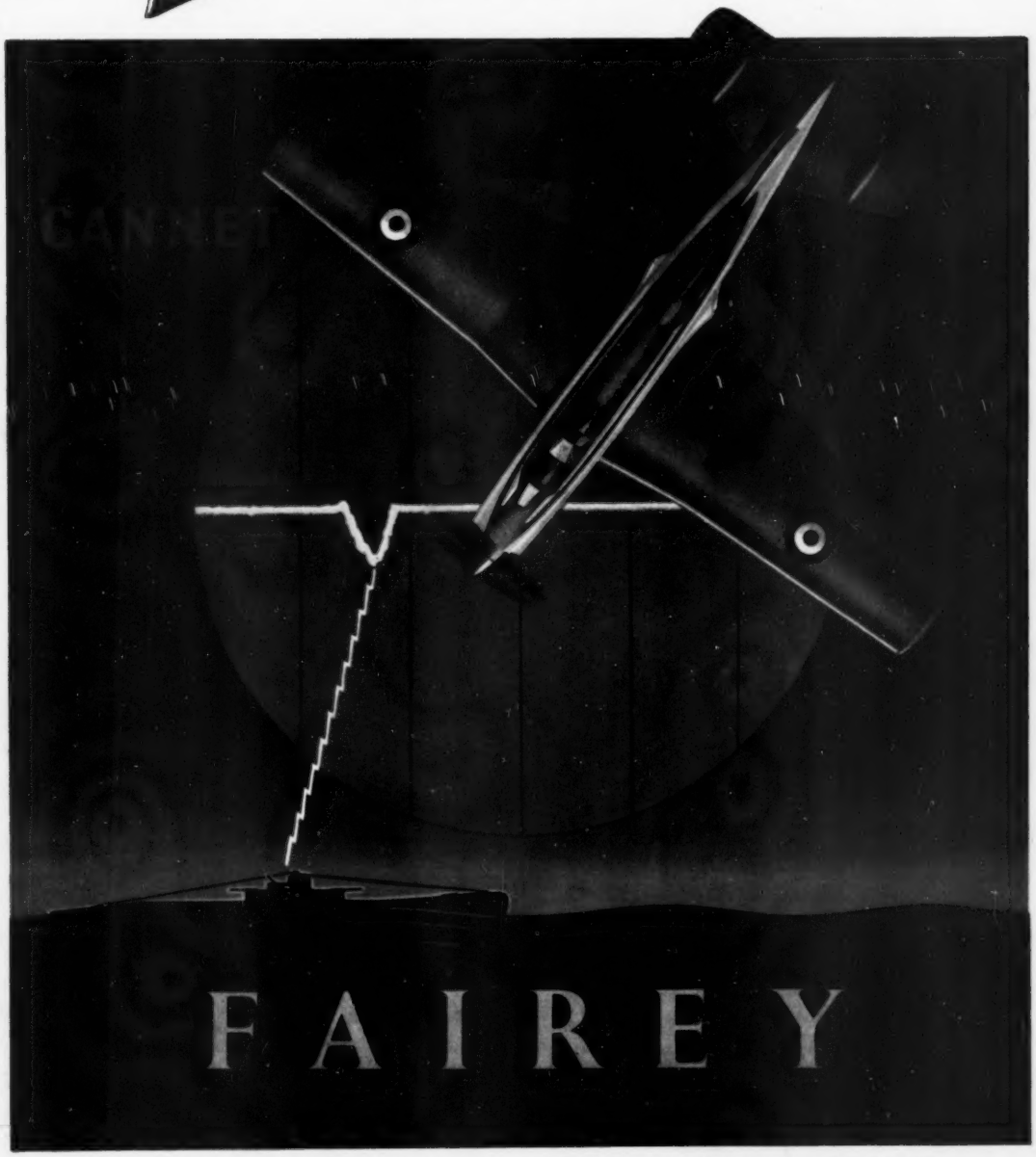

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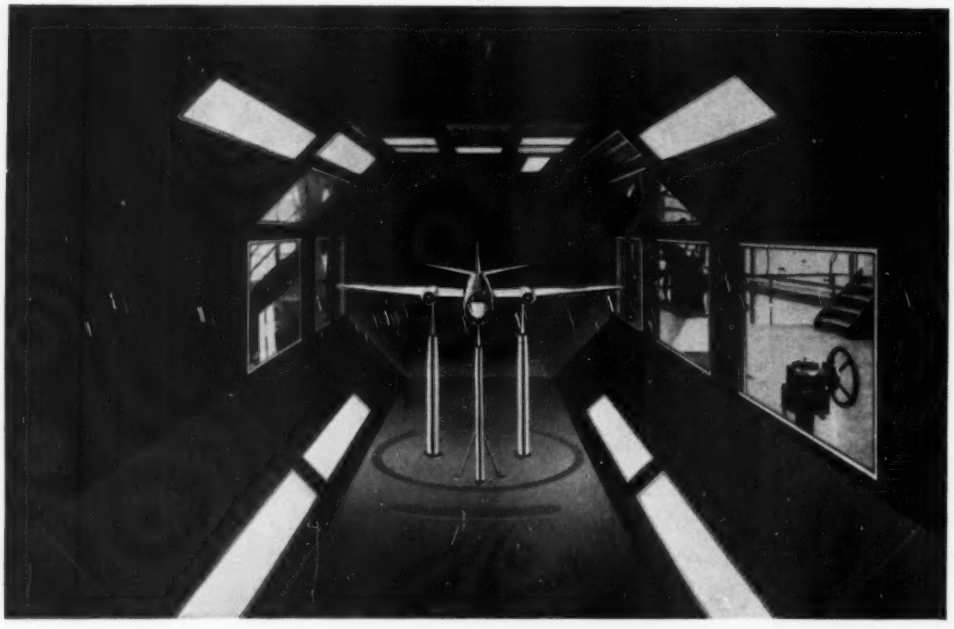

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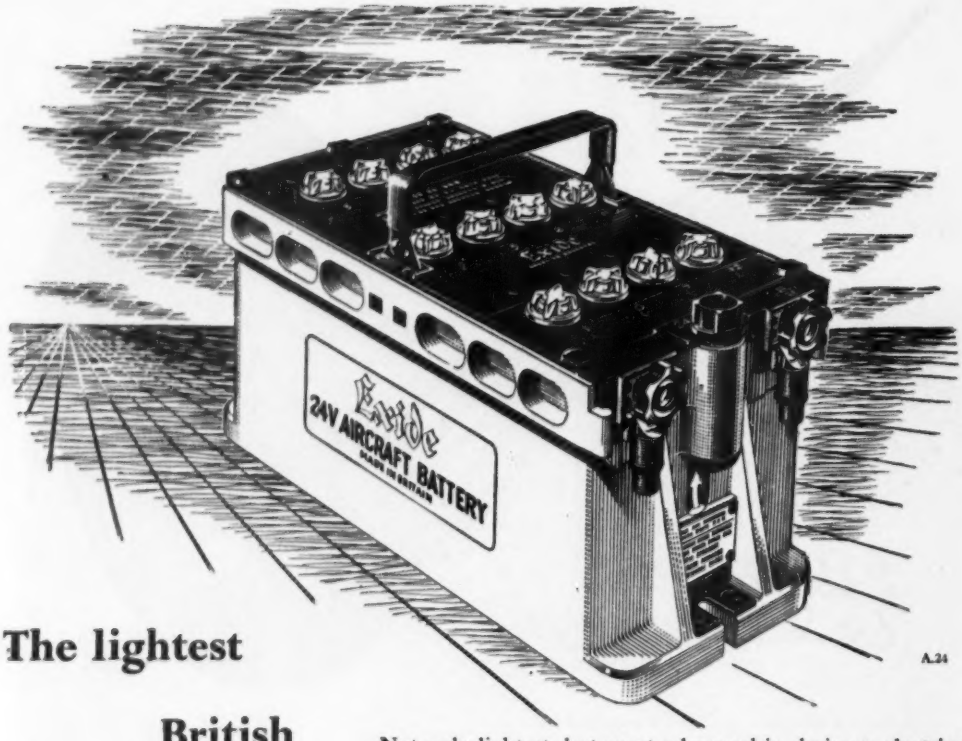

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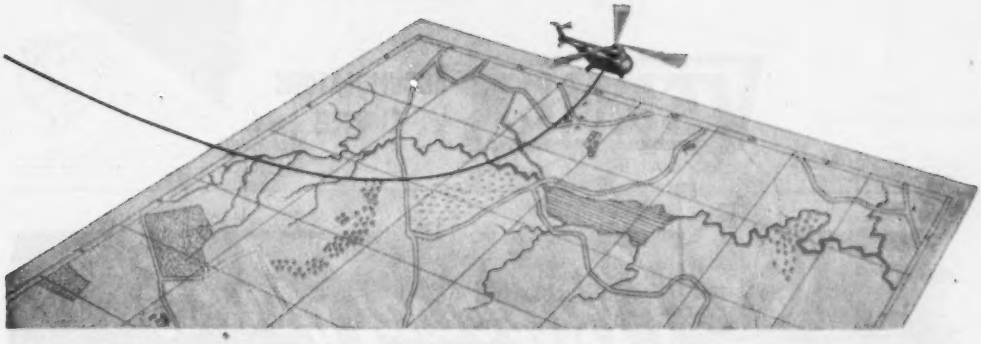

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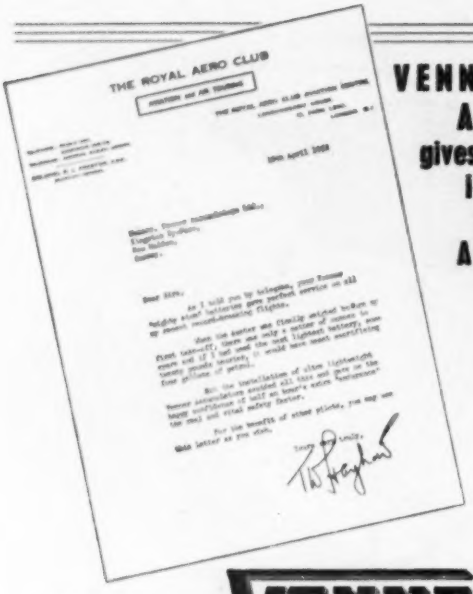
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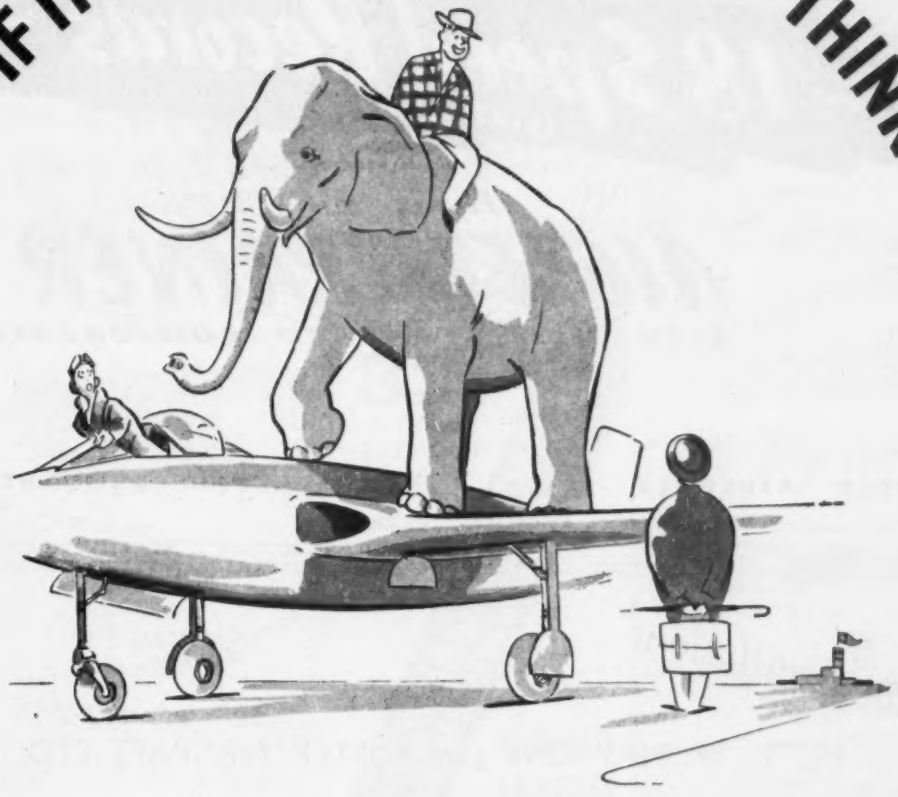

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EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

TECHNICAL EDITOR
C. B. BAILEY-WATSON, B.A.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices:
DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpress, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:
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8-10, Corporation Street.
Telegrams, Autocar, Coventry.
Telephone, Coventry 5210.

BIRMINGHAM, 2
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Thrusting Upwards

BRIEF but significant are the official announcements in this issue of higher ratings for British turbojets, and most significant of them all is the latest figure for the Sapphire. The disclosure that this unit, which completed a 150-hr Service type-test during 1950 at a rating of 7,220 lb, has now been cleared for an output of 8,300 lb is a matter for congratulations not only to Armstrong Siddeley, who developed the original Metropolitan-Vickers design, but also to the Wright Aeronautical Corporation, who secured the American licence during 1950. Already two applications of the first importance have been announced by the U.S.A.F.—one in the advanced swept-wing version of the Republic Thunderjet fighter/bomber, and the second (of special interest to us in Britain) in the Glenn Martin-built English Electric Canberra intruder. Meanwhile, the only installations announced in this, the country of the unit's origin, are solely of an experimental nature.

That fact, however, does not appear to be one of vital importance, for the Sapphire is certainly being built in quantity in British factories and could obviously be applied to a number of existing airframes, quite apart from the Canberra series, as an alternative to the Rolls-Royce Avon, and possibly to the Bristol Olympus. And here it may be remarked that, although the highest rating so far declared for the Avon is 6,500 lb, much greater thrusts have been forthcoming from experimental versions, which now range up from the early RA.1 to the RA.14 of undisclosed, perhaps undetermined, but no doubt impressive, output.

The successively increasing ratings established by the British type-tests are the signs that our big axial jets are developing healthily; and we are especially pleased to publish the mounting poundage of our offspring for the advice of our American neighbours (speaking in terms of Comet flight). Their own—and we cannot forebear to add, adopted—young hopefuls are shaping well, and no one outside America is better pleased than are we ourselves.

Room For The Turboprop

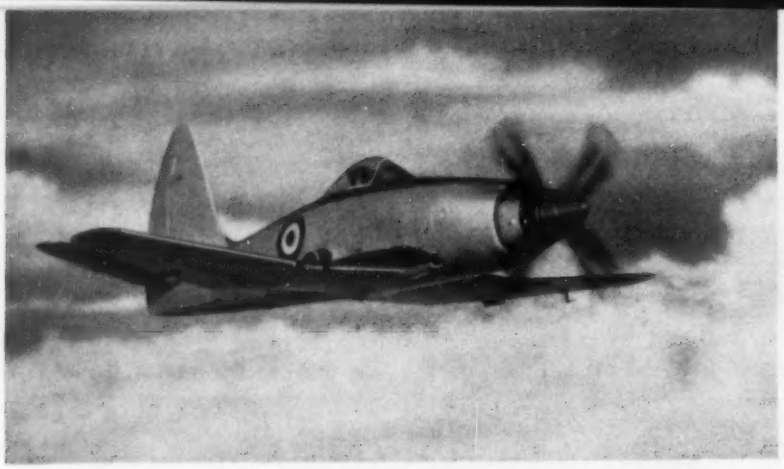
WHAT of British turboprops? It has frequently been said in the past that the turboprop more than merits its place in the hierarchy of prime movement, and that to disregard the type in favour of concentration wholly on the turbojet is wrong. Let us repeat at once that we whole-heartedly support this contention : there is room for the turboprop, room which cannot as effectively be filled by any other means.

It does seem, however, that British turboprops have been unfortunate, to say the least, in their struggle for recognition and success. Some of the misfortune is an "engine" matter, some of it is an "airframe" result, and yet another proportion is the outcome of official decisions. Whatever the cause, the effect is distressing when viewed from the standpoint of those who have championed the turboprop in the face of apathy.

The Rolls-Royce Dart is a fine little engine, and will power the Viscounts, but production of these aircraft seems slow in starting. It is foreseen that an ultimate Ambassador development might be an enlarged-fuselage, four-Dart version, but this is years away. The Armstrong Siddeley Mamba, in double form, is to power the Gannet, but here again production is still some way off : a four-Mamba (or two Double Mamba) variant of the Ambassador has also been mentioned as a possibility, but only for the distant future. No new plans have been announced for the similarly powered Apollo.

The A.S. Python is scheduled only for the Wyvern but, although a fine engine, it has been dogged by control problems for too long; the Navy needs Wyverns and has been waiting for them quite long enough. Finally, the Bristol Proteus: the Proteus 2 (in coupled and single units) will power the Princess boats and, more particularly, will also be fitted to the first prototype Britannia. Subsequent Britannias will have the more compact and higher-powered Proteus 3s.

In that sum, therefore, Britain has a family of promising turboprops which, although they have been in existence for years now, have not yet been put into service. We look forward hopefully to next year, when Viscounts, Britannias and Gannets may be rolling off the lines.



A breezy impression of a Wyvern T.F.4 strike fighter (Armstrong Siddeley Python turboprop) flown by D. Colvin.

"FLIGHT" PHOTOGRAPHS

A WEST-COUNTRY CALL

News and Impressions from Yeovil: Westland's Varied Activities

IT is always pleasant, especially when the sun shines, as it did the other day, to go down to the West Country and spend a few hours with Westlands at Yeovil. And a pretext was not difficult to advance, for the work in progress there is as varied as it is important.

Primarily we went to see how the Wyvern strike fighters for the Royal Navy were coming along; but before recounting such news about them as security allows, we may well summarize the progress of the type to date.

It is recognized that development has been a protracted, and necessarily costly business; indeed, it could hardly have been otherwise, involving as it has a wholly new power plant—the Armstrong Siddeley Python turboprop—and an airframe of appropriately advanced design. Moreoever, the combination is being developed for Naval service and this imposes unusually severe demands in several respects.

That the airframe itself has come in for its own share of modification will be well known to any diligent Farnborough visitor; but more particularly the difficulties have concerned the engine/airscrew combination, and in the exacting, and often dangerous task of overcoming these, the Westland test pilots have performed a service which one day, we trust, will be accorded more fitting recognition than is possible here.

Head of the team (it seems almost unnecessary to say so) is the perennial Harald Penrose, O.B.E., who has tested every Westland product since the Widgeon, and who, at 48, is among the most respected members of his profession. In the pressing matter of Wyvern testing and development flying, Penrose has two worthy lieutenants in the persons of R. S. Bradley and D. Colvin.

Well aware that modern naval strike fighters must be subjected in action to frequent and violent changes of attitude and power setting, the Westland pilots have deliberately and persistently handled their flying and engine controls in cavalier fashion while diving from high altitude and flying in turbulent air at low level; and in naming these men we do not forget the less spectacular contribution made by the Armstrong Siddeley and Rotol teams. Development is still progressing to enable the Wyvern to take up its duties with the Fleet, and many aircraft of the type are already complete.

Like all mortals, of course, aircraft constructors and operators are prone to become so preoccupied with their own immediate problems that they are not always able to view them in perspective. They tend to forget that others likewise have their afflictions, as witness the difficulties encountered in matching the Allison T-40 turboprop to the Douglas Skyshark, the U.S. Navy's counterpart of the Wyvern. (This reference is in no sense a stricture on two first-class American products, but merely a reminder that bliss may not always reign in other people's backyards.) Of the Breguet Vultur—another foreign prototype intended for somewhat similar duties, and, incidentally, one of the most promising turned out in France since the war—we are not able to speak with authority, though its troubles may be less because the turboprop employed is a single Mamba, the aircraft being boosted for high speed by a Nene turbojet.

It must be remembered, moreover, that just as Great Britain did much of the pioneer work in developing the jet fighter, so has she led the way in the application of the turboprop to strike aircraft; and the Wyvern is the expression of her advanced thinking in this regard.

The first prototype Wyvern (Type W.34), bearing the designation T.F. Mk 1 and powered with a Rolls-Royce Eagle piston engine, first flew on December 12th, 1946—over five years ago—and this version was credited with a speed of 455 m.p.h. The armament was one 20in torpedo, a 2,000 lb bomb, or eight 60-lb R.P.s, in addition to four wing-mounted 20 mm guns. An experimental development was fitted with a Rolls-Royce Clyde turboprop, and this machine actually antedated the prototype of the Python-powered T.F. Mk 2 (Westland Type No. W.35), which first took the air on March 22nd, 1949. Thus, the Python-Wyvern is just over three years old. Initial deck trials were put in hand a little more than a year after the first flight.

Westland's familiar S-51 demonstrator G-ALIK on an instructional flight, with one of the metal-bladed Naval Dragonflies in the foreground.

The next variant—the Python-powered T.3 (Westland Type No. W.38)—was, as its official designation signifies, a trainer.

The current strike fighter version, as we have said, is the T.F.4 (Westland Type No. W.35), and this is characterized by a "cut-back" engine cowling, to facilitate the loading of the starter cartridges; a "spear-tipped" Rotol airscrew; stiffer canopy; small fences on the trailing edge (these prevent a slight tug on the ailerons when the dive brakes are closed); modified aileron tabs; a taller fin and rudder, with horn balance; and a dihedral tailplane.

When the Wyverns come off the Yeovil production line they are flown (or, if the airfield is waterlogged, they may be taken by road) to Merryfield, which is the nearest Service station, and here they are put through their tests.

Wyvern production, of course, represents only one side of Westland activities, for the helicopter programme is developing healthily and the firm is further engaged in the reconditioning of Gloster Meteors. The latest helicopter development to take the air is an improved version of the S-51 Dragonfly, with metal rotor blades and servo control, which, Mr. Bradley assured us, has the easy handling characteristics of its later and larger stablemate, the S-55.

Two of the earlier S-51s (G-ALIK and G-AKTW) are engaged in instructional work at Yeovil, and on these machines tuition has been given to pilots from France, Egypt, Italy, Belgium and Denmark, in addition to several from the Royal Navy, R.A.F., R.C.A.F., the M.C.A. and B.E.A. For instructional flying the 51s are provided with a "hockey-stick" attachment, which, by pushing the tail up on contact with the ground, protects the tail rotor from damage. This fitting is not, however, made so strong that there is any risk of breaking the tail cone of the aircraft.

Though the new S-51 is somewhat heavier than its forerunner, Mr. Bradley has taken one to a height of 13,000ft in about 15 min. He told us, incidentally, that a Meteor 3 has held formation with one of these machines, though the top speed of the S-51 is only 103 m.p.h. This surely was the first occasion on which a jet fighter and a helicopter have kept company in the air, in this, or any other country.

Tracking tests on a metal-bladed S-51. The blades are coloured with red, blue and yellow chalk, and in rotating mark the flag seen in the picture, thus affording a check on the adjustment.

On the only S-55 yet flying in this country at least nine pilots have already gone solo, having averaged 46 min each and proving that conversion from the S-51 can easily be effected in one attempt.

At the time of our visit Gloster test pilot Geoff Worrall was lending a hand in passing out the reconditioned Meteors, and from Mr. Bradley (who is himself a demonstration pilot of accomplishment) we had an enthusiastic account of Worrall's "party piece." Even as he spoke the Gloster pilot came whistling into the Yeovil circuit in a Meteor 8 and the description we had been given became reality. At a speed which we estimated at only 175-200 kt, the Meteor turned on its back and went into an outside turn, which it sustained round the entire perimeter of the airfield—a masterly manœuvre demanding not only great flying precision but a viceless aircraft.

Before leaving Yeovil we were allowed a glimpse of the Westland S-55 production line in the shops and the prospect of these capacious machines appearing in British service (and eventually with British power plants) was a pleasant one to bring away.

TO BREAK A BOTTLENECK

A NEW process of gas-turbine-blade production, characterized as "advanced and unique," but not described in any greater detail, underlies the formation of a new company in the Midlands. Known as Blade Research Development, the concern has been formed jointly by Guest, Keen and Nettlefolds, and Clifford Motor Components, a firm which numbers fork-lift trucks among its products.

The blades will be forged by a G.K.N. subsidiary, Garringtons, Ltd., of Bromsgrove, who, with another factory at Darlaston, are stated to produce about one-fifth of this country's total output of drop forgings. The blades will be finished by the new company.

Chairman of the board of Blade Research Development will be Mr. Jack Bean, who is also chairman of Beans Industries and Garringtons, Ltd. The managing director of Garringtons, Mr. Ray Brooks, will assume an equivalent position with B.R.D., and Mr. R. Ferguson, an engineering planning consultant, will be general manager.

Clifford Motor Components will be represented by the chairman, Mr. Sol Joseph, and his brother, Mr. C. S. Joseph. The sixth member of the board is Mr. A. A. Rowse, chairman of Rowse Industrial Development and a number of other companies.

CONFIRMED AND REVEALED

RECENT concessions allow the publication of new designations for Service aircraft and power units. In a few instances, brief information is also permitted. Thus, it is confirmed that the Lockheed Neptune as used by the R.A.F. is to be known as the Neptune M.R.1. The names Sabre F-86E, Washington B.1 and Skyraider AD-4W are also officially promulgated.

New power plants which may be mentioned by name only are the Sapphire ASSa.5, Avon RA.14, and Nomad NMm.1 and NNm.2, and the following ratings are quoted for others: Sapphire ASSa.2, 7,380 lb; ASSa.6, 8,300 lb (this is a type-test rating and the unit concerned is referred to, under its maker's designation, on a later page); Avon RA.1, 6,500 lb; Ghost DGt.3 (Ghost 103), 4,850 lb (another type-test rating); Goblin DGn.5, 3,600 lb; Goblin DGn.6, 3,800 lb; Derwent RD.8, 4,200 lb; RD. 9, 4,000 lb.; RD.10, 5,000 lb; and RD.11, 4,500 lb.

The 5,000 lb rating for one of the experimental Derwents will come as a surprise to many readers, as may the relatively low output of the Ghost DGt.3 (Ghost 103). This latter unit is the production type military Ghost, and the discrepancy in rating between it and the civil Ghost (now, incidentally, quoted as 5,050 lb) results from the use of a bifurcated intake instead of the direct-entry type as on the Comet.

From Rolls-Royce, Ltd., we learn that the Derwent RD.8 was the unit fitted to the Meteor 4 which, flown by G/C. E. M. Donaldson, established a world speed record of 616 m.p.h. on September 7th, 1946. The RD.9 had a 15 per cent increase in mass flow, and the RD.10 was a scaled-up version utilizing the rotating parts of the larger Nene. The RD.11 was likewise a scaled-up development.

FATIGUE AT WESTMINSTER

IN the House of Commons on April 23rd, Mr. William Shepherd (Con., Cheadle) asked the Minister of Civil Aviation if he would state the findings of his department on the question of metal fatigue in aircraft, and what action he had taken in order to ensure action on the findings.

Mr. J. S. Maclay replied that the problem of metal fatigue was not new, or confined to aircraft; but higher flying speeds and the longer working life required had increased the attention that must be given to it. Tests were made by the Ministry of Supply to assist aircraft designers and the Air Registration Board, and the results were notified to his department. Any necessary precautionary action that had to be taken was then ordered by the Board.

Mr. Shepherd then said that it was stated that existing design would not be compatible with the light alloys being used; was the Minister, therefore, taking any action to see that alterations were made in existing design?

Mr. Maclay said that to answer this question would require further examination.

A. Cdre. A. V. Harvey asked if the questioner was aware that the Royal Aircraft Establishment had the matter well in hand and were satisfied that all immediate safeguards had been taken.

Commons questions on helicopters are reported on page 533.

IF SEVEN MAIDS WITH SEVEN MOPS . . . Unlike the walrus in "Alice in Wonderland," the pilot of this Hiller 360 helicopter was not dismayed by "such quantities of sand"—even though his task was to spray several miles of it in order to destroy the swarms of sand-hoppers which prove so irritating to holiday-makers. The scene is Worthing, Sussex, early in the morning; Pest Control, Ltd., had the contract.

FROM ALL QUARTERS

Sir Roy Dobson on Canada

LAST week Sir Roy Dobson, who is chairman of Avro Canada as well as managing director of the English parent company, addressed the Empire Club of Canada on the potentialities of Dominion aviation. He said that he first appreciated this potential in 1943, when both he and Sir Frank Spriggs made a tour of Canada and found that aircraft production *per capita* was higher there than in any other democratic country.

He was, however, shocked to learn that a large proportion of the graduates of Canada's universities went "south of the border" to find employment. Another interesting factor was the fact that Canada lay "exactly athwart" the shortest air routes between Russia and the U.S.A. In fact, economic, defensive and commercial needs all backed the Hawker Siddeley decision to take over the Crown company of Victory Aircraft and also Turbo Research, Ltd., which today are Avro Canada's airframe and engine divisions.

Sir Roy then outlined the work which Avro Canada had undertaken [described on pages 538-539 of this issue] and spoke of the scale of financing which had been required. Sterling had been transferred in bulk to a dollar area and several million dollars were currently in process of transfer—such was the confidence shown.

Many had expressed the opinion that Canada would always lag behind England and America in aeronautical research; that this was a fallacy was shown by the "veritable pipeline" connecting Avro Canada with its parent group, while Canada's own research teams and facilities were rapidly taking shape.

Sir Roy predicted that, once Canada's needs had been met, both the CF-100 and the Orenda would be in demand by other air forces; already the Orenda was fitted to the Sabre and this powerful combination would undoubtedly see service in England and elsewhere. As for the Group activities at home, Sir Roy announced that the Sea Hawk was now in Royal Naval service, while "several types" of rocket motor had been developed.

Australian Viscounts?

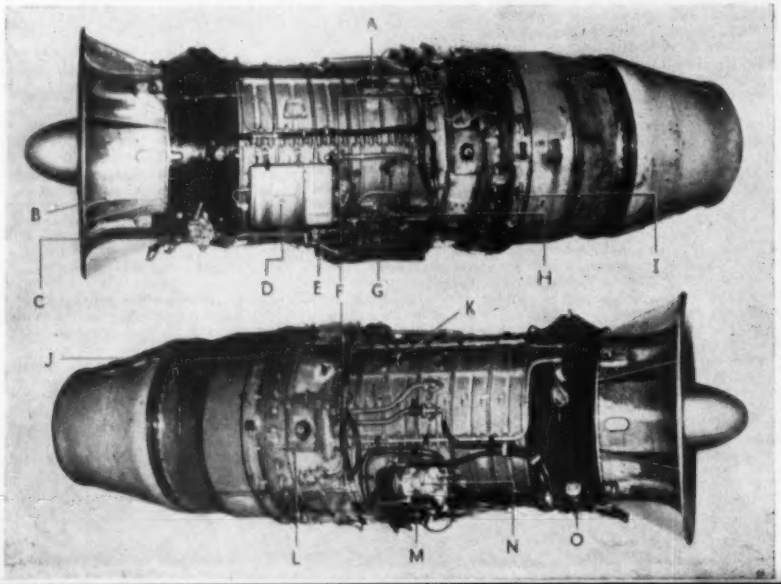
FIVE Vickers Viscounts are reported to have been ordered by the State-owned Trans-Australia Airlines. The report was unconfirmed by Vickers-Armstrongs, Ltd., at the time of going to press, but is believed to be accurate. The value of the contract would be in the region of £1 million. Other airlines to have ordered Viscounts are B.E.A. (26), Air France (12), and Aer Lingus (4).

Sapphire Progress

THE thrust of the Armstrong Siddeley Sapphire turbojet has been steadily developed ever since the existence of the engine was first announced in August, 1950. At that time the Sapphire had already been developed sufficiently for a type-test to be undertaken at 7,200 lb thrust. This rating was sufficient to interest the American Services and industry, and a licence agreement was signed between Armstrong Siddeleys and the Curtiss-Wright Corporation in January, 1951.

In November, 1951, the Sapphire was type-tested at 7,500 lb thrust, and last week it was announced that a developed Sapphire had successfully undergone a 150-hour M.o.S. type-test at a rating of 8,300 lb. This figure puts the engine comfortably ahead—so far as type-tested thrust is concerned—of any other turbojet; the next most powerful being the Pratt and Whitney J-48 (Rolls-Royce Tay) at 7,200 lb (wet) and the Rolls-Royce Avon at 6,500 lb. The Avon is capable of development to far greater output.

The new Sapphire, designated Mk 100 Series 3, is going into production at the parent company's factory at Coventry and at the Hucclecote plant of another Siddeley Group member, Brockworth Engineering, Ltd. In the U.S.A. the Wright J-65 Sapphire is in production at Wood-Ridge, N.J., and will also be produced by the Buick division of General Motors.



Port and starboard views of the Sapphire Mk 100 Series 3 (ASSo.6) turbojet referred to in the item above.

A—Igniter solenoid valve
B—Test intake-flare
C—Engine oil pumps
D—Oil tank
E—Acceleration control
F—Fuel distributors
G—Main fuel filter
H—Flow control
I—Torch igniter
J—Spray jets
K—Starting bleed-valve
L—Main burners
M—Tachometer generator
N—Fuel pump
O—Accessory-drives bevel-gear box

FAMILY GROUP: Eighteen years of Lockheed development are epitomized in this photograph, showing six Lockheed types reunited at Burbank, California. Since the Electra of 1934, Model 14 of 1937, and Lodestar of 1939 (the small machines, left to right) capacities have increased from twelve passengers to between 50 and 100 in modern Constellations (foreground) and 180 in the Constitution (rear). Fastest of the family is the Super Constellation (nearest camera), for which a speed of 450 m.p.h. is predicted when turboprops are installed. Gross weights range from 10,500 lb for the Electra to 184,000 lb for the Constitution. It is announced that orders for the Super Constellation now total a quarter of a billion dollars, for the U.S. Military Services and eleven airlines.

Mr. G. H. Dowty R.Ae.S. President

ELECTED president of the Royal Aeronautical Society for 1952-53 is Mr. G. H. Dowty, F.R.Ae.S., chairman and managing director of Dowty Equipment, Ltd., and chairman of its associated companies at home and abroad. Mr. Dowty has had a very long association with the R.Ae.S., having been elected a student member in 1918, an Associate Fellow in 1926 and a Fellow in 1937. He is now a vice-president of the Society and is a member of a number of its committees, including those concerned with future policy, finance, and the *R.Ae.S. Journal*. He is an Associate Fellow of the Institute of the Aeronautical Sciences of America, and was one of the founder-members of the Institution of Aeronautical Engineers, which was amalgamated with the R.Ae.S. in 1927.

Mr. G. H. Dowty

Mr. Dowty was educated at the Royal Grammar School, Worcester, and between 1916 and 1931 was successively with Heenan and Froude, Worcester; British Aerial Transport Company, Willesden; T. Cook and Sons, York; the Dunlop Rubber Co.; A. V. Roe and Co.; and Gloster Aircraft.

He has been concerned with the development of undercarriages since about 1922 and was the inventor of one of the early deck-landing arresters developed in this country. In 1931 he founded his own first company with one man.

British Helicopter Expert for U.S.A.

YET another distinguished aeronautical engineer and designer has left this country for America: Dr. J. A. J. Bennett, D.Sc., Ph.D., D.I.C., F.R.Ae.S., until recently head of the helicopter department of the Fairey Aviation Co., Ltd., is now understood to be in New York. Before the war Dr. Bennett was with the Cierva Autogiro Co., and during the war he served in the Army and Air Ministry, becoming Chief Technical Officer, Airborne Forces Experimental Establishment, in 1941.

His desire to take up residence in America—where his brother has already made his home—probably follows his period of service as Principal Technical Officer to the British Air Commission in America from 1942 to 1944 and his attachment to the U.S. Army Air Technical Service Command, 1944-45. He was a founder-member and is a vice-president of the American Helicopter Society and also a founder-member of the Helicopter Association of Great Britain. Since 1948 he has been chairman of the S.B.A.C. Helicopter Airworthiness Panel.

Dr. Bennett mentioned no particular plans before leaving this country, but he is known to have "one or two contacts" and may make himself available in a consultative capacity.

R.Ae.C. Officials and Committees

THE Royal Aero Club announces that the Rt. Hon. Lord Brabazon of Tara, P.C., M.P., has been re-elected president of the Club for the year 1952-53.

Mr. Whitney Straight, C.B.E., M.C., D.F.C., retires from the position of president, which he has held since March, 1946, and is appointed a vice-president, while Mr. S. Kenneth Davies, C.B.E., vice-president since 1948, now becomes chairman, with Col. W. C. Devereux, C.B.E., as vice-chairman.

During his tenure of office as president, Mr. Whitney Straight has done much valuable work for the Club. So far as private flying is concerned, he will be chiefly remembered—apart from his share in the design of the pre-war Miles Whitney Straight—for his chairmanship of the Advisory Committee on Private Flying, whose report, published as a White Paper in 1947, contained recommendations which, if acted upon by the Government of the day, might have radically changed the present rather gloomy picture. He has also played an important part in R.Ae.C. negotiations with the M.C.A.

Mr. S. Kenneth Davies is another official of the Club who has always had the interests of the private owner very much at heart. He was chairman of the R.Ae.C. private flying and air touring committee until Mr. J. C. C. Taylor took it over last year.

Col. Devereux is best known as managing director of Almin, Ltd., and chairman of a number of companies mainly concerned with aircraft metallurgical production.

Executives, and members of the Club Committee, are as follow (the list of other committees and officials will be given next week):—

President.—Lord Brabazon of Tara, M.C., P.C.

Vice-Presidents.—Capt. Sir Geoffrey de Havilland, C.B.E., A.F.C., Lord Gorell, C.B.E., M.C., Sir Francis K. McClean, A.F.C., Sir Frederick Handley Page, C.B.E., Whitney W. Straight, C.B.E., M.C., D.F.C., The Duke of Sutherland, Kt., P.C.

Chairman.—S. Kenneth Davies, C.B.E.

Vice-Chairman.—Col. W. C. Devereux, C.B.E.

Committee.—Capt. K. J. G. Bartlett, Air Marshal Sir Roderick Carr, K.B.E., C.B., D.F.C., A.F.C., G/C. W. N. Cumming, O.B.E., D.F.C., J. Cunningham, O.B.E., D.S.O., D.F.C., E. S. Greenwood, O.B.E., Capt. A. G. Lamplugh, C.B.E., Maj. R. H. Mayo, O.B.E., H. W. H. Moore, G/C. C. S. Morice, D.S.O., M.C., Maj. H. A. Petre, D.S.O., M.C., Maj. J. Stewart, O.B.E., L. Swan, J. C. C. Taylor, M.B.E., C. F. Uwins, O.B.E., A.F.C., Frank Woodhead.

R.Ae.S. Medals and Awards

ON Thursday, May 29th, when the 40th Wilbur Wright Memorial Lecture is given in London (by Sir Harry M. Garner, K.B.E., C.B., M.A., F.R.Ae.S., Chief Scientist to the Ministry of Supply, whose subject will be *Prophecy and Achievement in Aeronautics*) the R.Ae.S. medals and prizes will be awarded, as is the custom on this occasion. Names of recipients are announced by the Society as follow:—

The Society's Gold Medal (the highest honour which the R.Ae.S. can confer for work of an outstanding nature in aeronautics).—Prof. T. von Karman, for his work in aerodynamic theory.

The Society's Silver Medal (for work of an outstanding nature in aeronautics).—Dr. H. Sutton, for his work over many years on metallurgy in aircraft design.

The Society's Bronze Medal (for work leading to advances in aeronautics).—H. Povey, for his work on the production of the Comet.

British Gold Medal (for practical achievement leading to advancement in aeronautics).—G. R. Edwards, for his work in aircraft design.

British Silver Medal (for practical achievement leading to advancement in aeronautics).—Dr. D. M. Smith for his contributions in the development of British gas turbines.

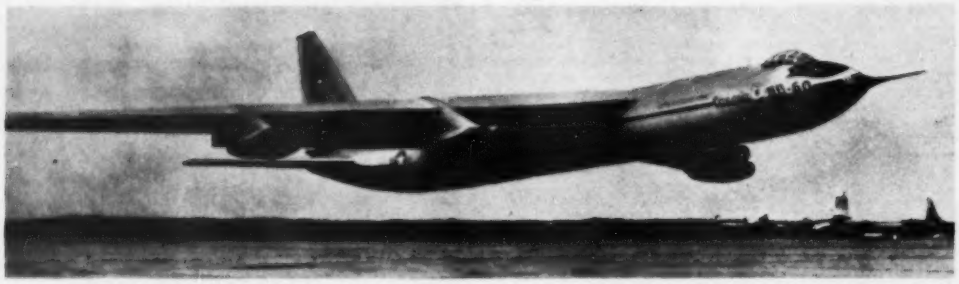
Wakefield Gold Medal (awarded annually to the designer or inventor of any apparatus tending towards safety in flying).—J. Martin, for his work on ejector seats.

George Taylor (of Australia) Gold Medal (awarded annually for the most valuable paper read during the previous session).—W. Tye, for his paper on *Modern Trends in Civil Airworthiness Requirements*.

Simms Gold Medal (awarded annually for the most valuable paper on any subject allied to aeronautics).—H. H. Gardner, for his paper on *Structural Problems in Advanced Aircraft*.

Herbert Ackroyd Stuart Memorial Prize (for the most valuable paper on applied thermodynamics).—Dr. J. Seddon, for his paper on *Air Intakes for Gas Turbines*.

Edward Bush Memorial Prize (awarded annually for the most valuable paper on applied aerodynamics).—Handel Davies, for his paper on *Some Aspects of Flight Research*.



BATTLESHIP No. 2 : On April 18th the prototype Convair YB-60 made its first flight, both take-off and landing being made at Carswell, A.F.B., adjoining the Convair factory at Fort Worth, Texas. The undercarriage has been officially "touched out" for security reasons, so unorthodox practice in this respect is possible. Last week we published a similar photograph of the Boeing YB-52, which flew three days earlier.

HERE AND THERE

About the World's Airlines

THE issue of *Flight* for May 16th—a fortnight hence—will be an enlarged special issue, the Commercial Aviation Number. It will include, among other features, a review of the principal aircraft now in service with the World's Airlines; a guide, in handy reference form, to operating companies, their fleets, routes, and background; and special messages from airline chiefs of many countries.

Reserves Stand Down

RELEASE from active duty of the 22 U.S. Air National Guard wings is to begin on July 10th and should be completed by the end of the year. These units, which correspond to the R.Aux.A.F. squadrons in this country, were called up after the opening of the Korean campaign and many are serving outside the U.S.A. Broad U.S.A.F. policy is to have all its members on a "willingness to serve" basis, and new regular formations are being formed to take the place of the A.N.G. units; many A.N.G. officers have signed on for indefinite periods to ease present aircrew shortage. Total U.S.A.F. regular strength is expected to rise from the present 920,000 men to some 1,210,000 by June, 1955.

The Enemy's Strength

STRENGTH of the Communist air force in Korea has been assessed at 1,700 aircraft, more than half of these being fighters. Quoting this figure last week, the U.S.A.F. Chief of Staff, Gen. Vandenberg, said that some 1,900 tank-cars of fuel and 100 goods wagons would be required each month to maintain the force at its present rate of operations. Additionally, the Soviet Union was supplying some 70 Mig-15s per month to make good operational losses.

EIGHT-JET BOMBER MAIL : This cover was carried on the maiden flight of the YB-52 from Seattle to Larsen A.F.B., Moses Lake. It bears the signature of the pilot, A. M. ("Tex") Johnston.

CANADIAN INTER-SERVICE PARTY : Members of the National Defence College of Canada recently visited the Bristol Aeroplane Co., Dowty Equipment, Ltd., and other factories. Seen here examining the cockpit layout of the Bristol 171 helicopter are Col. R. P. Rothschild, G/C. G. G. Truscott and (from the Royal Canadian Mounted Police) Supt. J. R. Lemieux. Other representatives were Capt. N. E. G. Roper, R.C.N., and Brig. R. E. A. Norton.

Bigger Parasites

THE U.S.A.F. announced last week that Convair at Forth Worth had been conducting experiments involving the air-launching of Republic F-84 Thunderjets from B-36 bombers. The statement made no mention of recapture of the fighter by the B-36, which—according to the *Fort Worth Star Bulletin*—an "accidental observer" claims to have seen. The newspaper said that "a small object" was dropped from the bomb bay of the B-36. It then "seemed to grow wings" and flew round the bomber before being "recaptured."

World's Military Aircraft

IN response to the requests of many readers, a 40-page review of *Military Aircraft of the World*—the central feature, by H. F. King, of the recent special number of *Flight* under that title—has been reprinted in paper-cover book form. Containing 180 illustrations and some 10,000 words of text, it is obtainable at 2s. 6d. from booksellers or at 2s. 8d. by post from Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

Aviation Medicine Honours

MEDICAL director of the U.S. Civil Aeronautics Administration and its preceding organizations since 1938, Dr. William R. Stovall was elected president of the Aero Medical Association at the recent meeting of that body in Washington. M. Armand Robert, medical director of Air France, was elected a vice-president, and Dr. Kenneth G. Bergin, B.O.A.C. regional medical director was among the ten new Fellows elected as "having made outstanding contributions to aviation medicine."

Stand-in

IT is now learned that Mr. S. Scott-Hall was unable, through illness, to deliver his New York lecture on *Government Collaboration in Aircraft Development*. Instead, the paper was ready by Mr. Shaw, of the British Supply Mission in Washington.

Pioneer Aviation Writer

THE death occurred at Brighton last week of Mr. Frank Hewartson, who, living in France 40 years ago, described for the *Continental Daily Mail* and other newspapers many of the exploits of the pioneer French pilots. During the First World War he was a member of No. 1 Squadron, R.F.C.

Called Off

CHARGES against a pilot and bombardier at Randolph A.F.B., Texas, who were to be court-martialled for refusing to fly, have been dropped after medical and psychiatric investigations. A number of other pending courts-martial of "sit-down pilots"—the case against whom we reported last week—have been called-off "pending re-consideration of policy."

Looking Back

THE Associated British-Pathé "scrapbook" film, *Here's to the Memory*, to which reference was made in *Flight* of March 21st, had its world première at the Rialto Theatre, London, on April 18th and is to be generally released on May 12th. Some of the sequences date back to the 1890s and will evoke many nostalgic memories. Besides some excellent "vintage" shots of aeronautical flavour, compered by Lord Brabazon, there are some breathtakingly beautiful gliding sequences, and in general the film is well worth looking out for.

Aircraft Golfing Society

A TEAM of members of the Aircraft Golfing Society recently visited Belfast for a two-day match against executives of Short Bros. and Harland. The Short and Harland team, led by Mr. R. E. Harvey and Capt. H. St. John Fancourt, were the winners by 4½ points to 3½. On Friday, May 23rd, in London, the Aircraft Golfing Society is holding its eighth annual dinner; the Secretary of State for Air has accepted an invitation as guest of honour. The Society's hon. secretary is Mr. Brian D. Songhurst, 55b, Woodville Gardens, London W.5.

S. OF S. LOOKS IN: The Secretary of State for Air, Lord De L'Isle and Dudley, investigates the capacious hold of the Universal Freighter during a recent visit to Blackburn and General Aircraft, Ltd. With him, in the foreground, are Mr. E. Turner, G.A.L. managing director, and Air Chief Marshal Sir William Dickson, Air Member for Supply and Organisation.

IN BRIEF

THE 1952 visits programme of the R.Ae.S. Graduates' and Students' Section is as follows: May 10th, N.P.L.; July 5th, Bristol Aeroplane Co.; August 13th, de Havilland Engine Co. (Leavesden Works); October 25th, College of Aeronautics, Cranfield.

* * *

The Board of Helliwells, Ltd., has been augmented by the appointment of Messrs. G. Taylor Powell, J. Boden, J. Ransom and A. Thomas as directors. Mr. Eric Sanders retains his managing directorship.

* * *

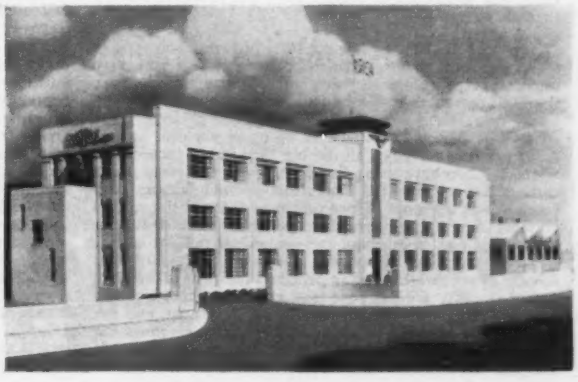
Mr. R. J. B. Woodhams, B.Sc.(Lond.), A.F.R.Ae.S., M.I.A.S., has been promoted to the post of chief designer to Air Service Training, Ltd., where he will be responsible, under Mr. H. W. Sidwell, O.B.E., A.F.R.Ae.S., for all design work in the aircraft division. His career has been with the Hawker Siddeley Group throughout—first at Armstrong Whitworth, then at Hawkers; next at Avros (as chief project engineer) and finally at A.S.T., where he became assistant chief designer in April of last year.

* * *

Mr. J. A. Hunt, M.B.E., general manager of the Hymatic Engineering Co., Ltd., has been elected president of the British Compressed Air Society.

* * *

Speaking at the annual foremen's dinner of Short Bros. and Harland, Ltd., Sir Edward D. A. Herbert, O.B.E. (chairman), referred to the Comet contract and the development of the Castlereagh factory, saying that it was the intention to make the fullest use of Northern Ireland's manpower. He also welcomed back, from convalescence after illness, Mr. Brooke-Smith, chief test pilot.



EXPANSION: A new machine-shop has added 26,000 sq ft to the Rotol, Ltd., factory near Gloucester, while a new design-office (above) now occupies a third storey added to the main building (right).

PAN AMERICAN AIRWAYS are taking delivery of 19 Douglas DC-6Bs this year and 20 more in 1953. "Liberty Bell," right, is one of the seven delivered for today's inauguration of tourist services on the North Atlantic. The P.A.A. services, named "Rainbow" and employing 80-seat DC-6Bs, have already attracted 15,000 bookings.

Our American Correspondent Reports . . .

RECENT warnings, in the British Press, against complacency about Britain's lead in turbine commercial aircraft have been read here with interest. What was said was pretty well what the Americans themselves would like to believe. They feel that by 1956 the United States jet transports now under construction should be ready to go into service. Until that time they are going to rely on the improved economy of such aircraft as the DC-6B and the compound-engined Constellation and DC-7. They think that these types, by their economy on a seat-mile basis will effectively hold their position and may even prove efficient enough to delay the advent of the turboprop. In fact, C. R. Smith, president of American Airlines, said during an interview with *American Aviation:* "The turbo-propeller transport will come along later, a couple of years or more after the jet type." In this same interview he suggested that: (*a*) a conversion job from a reciprocating engine to a turboprop on an existing type would never be satisfactory; (*b*) American-built jet transports will be in service by 1957-58; (*c*) the Americans are unlikely to buy British jet transports; and (*d*) the British turbo-jet—and even perhaps our turboprop types—will not be able to compare in economy of operation with United States transports powered with their latest compound reciprocating engines.

In trying to assess the value or intent of any public utterances by business men in the States, due regard must be paid to what is behind such remarks from a business and competitive point of view: the wheat of honest opinion must be separated from the chaff of publicity. No operator is going to tell his competitors what he's going to do, and this current drive to dismiss all British aircraft as uneconomic has more behind it than just financial appraisement. But the fact remains that not only are the operators prepared to pin their faith for the years 1952-1957 on the economic development of their existing types, but Lockheed, Douglas, and perhaps Boeing are hard on our heels with their own jet transports—transports which will be bigger, faster and more economical than are ours of today.

* * *

THIS talk of economy has not been brought about just as an argument to offset British progress. It is a very, very important aspect of the situation here. Although during 1951 the U.S. passenger traffic exceeded the 1950 mark by some 27 per cent, with a volume of over 21 million passengers and an average passenger load-factor of 69.48 per cent against 62.67 per cent for 1950, all the big carriers are exceedingly worried. Costs have been going up steadily. One of the major carriers has just reported that, although their January 1952 revenue was up some 18 per cent over that for the corresponding month last year, their profits—before deducting taxes—declined from about two-and-a-half million to just under one million. Operating expenses for the first two months of 1952 were up by 42 per cent over those of the same period in 1951. During 1951 total airline revenues went up 9.29 per cent, but expenses rose by 6.48 per cent, and the gap between operating expenses and operating revenues has been decreasing steadily. On top of this, nearly every big company has laid out a large aircraft expansion and replacement programme which will not only be very expensive, but will mean more seats to fill. The value of this new equipment is said to be in the neighbourhood of $350 million and it will increase the operators' seat-mileage by some 59 per cent. This will mean that many "new" people have got to start flying once these new aeroplanes go into service, and that they must fly regularly. Today the Korean war is responsible for a lot of business, but the aftermath of the last war and the lean years of 1946-1948 are not forgotten. Any business recession or an armistice in Korea—both perhaps inter-connected and by no means outside the bounds of possibility—would bring a severe slump in all sorts of travel, and it is difficult to see quite how the air-transport industry here, which would be the first to be hit, could stand such a sudden drop in revenue. Today, and in order to keep pace with their overheads, the major operators have already filed applications with the C.A.B. for a flat across-the-board increase in fares of one dollar and the abolition of the reductions for return fares, with possible modification of the mid-week "family plan" discounts. So far only the first request has been granted. This is only the start. But one has not heard of any plans to introduce drastic economy campaigns inside the airlines themselves.

* * *

LOOKING ahead towards the day when the first all-American jet transport is wheeled out of the hangar (an event that will work the firm's publicity department overtime), Lockheed talk of twenty to twenty-four months before their machine is ready to fly, and presumably Douglas will shoot for a similar date. In both cases it may be the engine situation that will be a governing factor. Unless the United States engine manufacturers do a lot to improve their hours between overhauls, the first American-built jet transport is pretty certain to be fitted with British-designed (but U.S.A.-built) power units. In the meantime, order books are reasonably full for the last of the reciprocating-engined types. The Defense Production Administration (which controls the allocation of strategic materials) has announced that work can continue on the 357 transports already approved and now under construction, and has authorised the construction of a further 82 large commercial aircraft for the period ending September, 1954. Of these new machines, 44 are for the American market and 28 are for export. They include 29 DC-7s (25 for American Airlines and four for National Airlines) which, like the Constellation 1049Cs, will be fitted with the Wright R-3350 compound engines. Wrights are said to have orders worth $31 million for this power unit; and if it comes up to published expectations it will be the answer to their drive for economy. Claims made talk of a saving of some 20 per cent on fuel consumption. K.L.M. are also big buyers under the current production programme. They have obtained a $7 million loan from the International Bank towards the purchase of 23 American aircraft, complete with spares. These include nine Lockheed 1049Cs, seven Douglas DC-6Bs, one Douglas DC-6A, and six Convair 340s. The loan is guaranteed by the Dutch Government. Nice work if you can get it!

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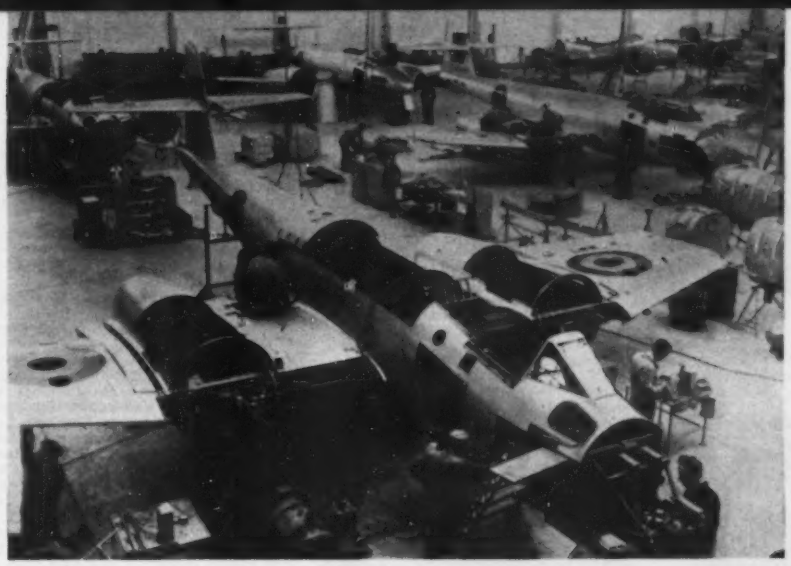


The scene at the final-assembly stage of Meteor production in the Gosselies factory. The Rolls-Royce Derwent turbojets are built by the Fabrique Nationale at Liège.

AVIONS FAIREY COMES OF AGE

Trials and Triumphs of an Anglo-Belgian Enterprise

EVEN to Fairey directors L. Massey Hilton and Major Maurice Wright, who have been at the flying game for 35 and 44 years respectively, 21 years is a lengthy stretch to illuminate with recollection. But over dinner in Brussels the other evening they fell to reminiscing for our benefit about their company's association with Belgium, and to corroborate their memories Mr. Ernest Tips, managing director of the Belgian subsidiary, Avions Fairey, was at hand. This, then, is the genesis of Avions Fairey as we heard it told.

It all began at the R.A.F. Display of 1930, when, after one of the most keenly contested series of trials for R.A.F. re-equipment, the prototype Fairey Firefly IIM intercepter was presented before the public. That the Fairey company had not been awarded a contract for this remarkable fighter in no wise detracted from the esteem in which it was held, and among the official guests from abroad there were many who gazed upon it covetously.

At that time another contest for single-seat fighters was nearing its climax—in Belgium, where a Jupiter-engined Czech Avia was hotly tipped as the winner; but a chance remark at Hendon had given the Fairey directors other ideas, and without delay the Firefly was flown across to Belgium—"on spec" as it were—by that prince of demonstrators F/L. Chris Staniland.

Such was the impression made by the little biplane that a further series of flight and ground demonstrations was requested by the authorities; and by the time sixteen different Belgian pilots had sampled for themselves the Firefly's qualities of speed, climb and manœuvrability the outcome was no longer in serious doubt.

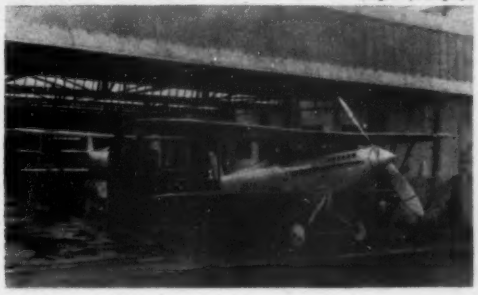
TOPICAL interest is added to this factual account by the recently announced appointment of Air Marshal Sir Robert Foster to command the Northern Tactical Air Force, composed of the R.A.F.'s Second Tactical Air Force, the Netherlands Tactical Air Command, and No. 2 Belgian Wing. The potential value of the Avions Fairey works as a maintenance and repair base in the heart of the new command is obvious.

When the final stage of the trials was reached, a crucial test was unexpectedly imposed—the aircraft was to be dived while carrying recording instruments to show that it had attained its terminal velocity. Of the competitors still in the running, only Staniland in the Firefly agreed to undertake the trial and its successful completion was the final and deciding factor in the choice of the Firefly. In due time a contract was placed for 45 machines, with the stipulation that Belgian labour should be employed for the assembly of the greater part.

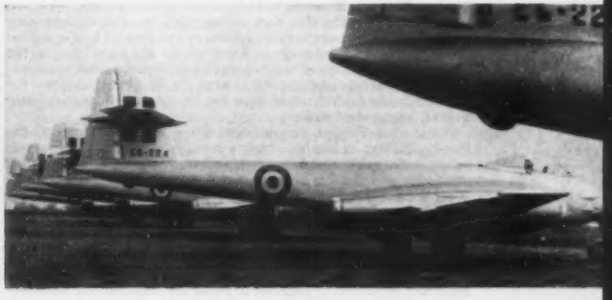
As the fork is to the knife, so was the two seater Fox IIM day bomber to the Firefly intercepter, and the adoption of this type by the Belgians was only a matter of time; the first contract was, in fact, placed early in 1931. During March of the same year work began on the Fairey branch factory at Gosselies, near the great mining centre of Charleroi, and on September 12th a Belgian company, under British and Belgian direction, was officially registered as the Société Anonyme Belge Avions Fairey.

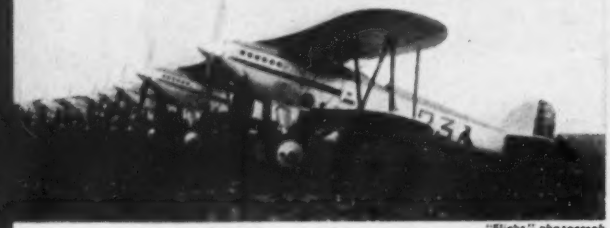
The undertaking proved a happy and fruitful one, and during 1932 thirty-six Fireflies were delivered from Gosselies to units of the Belgian Air Force. Another two dozen followed in 1933, bringing the total to 60 machines, and additionally to these no

Fairey Fireflies (Rolls-Royce Kestrel IIS) coming off the line in the 1930s. The circumstances of the Firefly's adoption are related on this page. "Flight" photograph



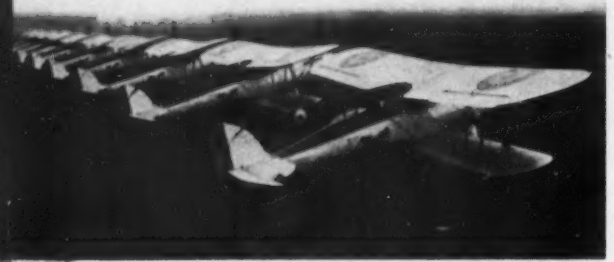
Meteor 8s fresh from the Gosselies assembly shops. It will be noted that the fin flashes are painted both above and below the tailplane.





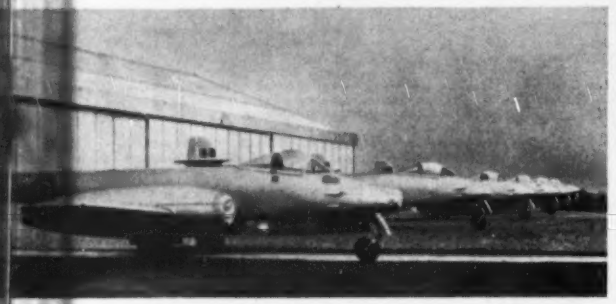
"Flight" photograph

A fighter squadron of the Belgian Air Force equipped with Fairey Fireflies.



"Flight" photograph

Fox IIM two-seater light bombers on a Belgian airfield.



Meteor 8s assembled at Gosselies from Gloster and Fokker components.

AVIONS FAIREY COMES OF AGE...

fewer than 178 Foxes were completed and delivered during the years 1933-39. The peak year was 1935, with a total of 79 Foxes completed.

All production Fireflies were powered with the Roll-Royce Kestrel IIS engine, but a number of Foxes were fitted with the 860 h.p. Hispano Suiza 12Y, and so outstanding was the performance of this Hispano-Fox that during 1936 the Belgian company evolved a single-seater version known as the Fox VII, Mono Fox, or—in the Belgian language— Kangourou. Six guns (four in the upper wings and two in the fuselage) were fitted to this machine. It should, perhaps, be explained that the Belgian soubriquet for this handsome aircraft arose from the location of its large radiator well aft under the fuselage.

To meet a Belgian requirement for a fighter to succeed the Firefly, Faireys in England built a private-venture prototype with an Hispano 12Ycrs *moteur canon* and four rifle-calibre Browning guns. Named the Fantome, it was flight-tested at Fairey's Great West Aerodrome (generally known as Heathrow, and now, much extended, as London Airport) after construction at Hayes; it was then flown across to Belgium for demonstration before the authorities there.

During a display at Evère, the original machine was destroyed; but, four sets of all fittings having been made, the remaining three sets were sent to Belgium to assist and expedite the construction of Fantomes for further entry, in due course, in the competition. The delay in some degree coincided with a change in the specification; but in the interim the Russians had learned that Faireys had produced an attractive fighter and had ordered two examples. These were built in Belgium (where, incidentally, the type was known as the Féroce) and were crated for shipment to Russia *via* Antwerp. The third machine was also built in Belgium and delivered to England for Air Ministry trials at Martlesham Heath. At this date, however, Air Staff opinion favoured the eight-machine-gun formula and no British order for the Fantome was forthcoming.

Last of the piston-engined fighters to be built by Avions Fairey were the first two of a batch of 80 Hawker Hurricanes ordered for the Belgian Air Force. They differed from the contemporary British eight-gun type in being armed with four of the hard-hitting 12.7 mm F.N.-Brownings, and it is regrettable that no pictures of this little-known Hurricane variant have survived.

When war broke out on May 10th, 1940, no fewer than 245 military aircraft had been completed at Gosselies.

Even in the early days of Avions Fairey Mr. Tips was not too preoccupied with military commitments to preclude his designing and building, during 1934, the prototype Tipsy S, capable of a speed of nearly 90 m.p.h. on the 18 h.p. of a 600 c.c. Douglas flat-twin engine. This fascinating little single-seater was something of a milestone in ultra-light-aircraft development and was followed, during the years 1936-38, by a production-series of nineteen S.2s with various engines. Companion types were the Tipsy B two-seater, of which five were turned out during 1936-37, and the Bc (cabin) development. Production of the Walter Mikron-engined Bc type totalled fourteen aircraft between 1933 and 1937.

The last of the pre-war Tipsys was the Model M two-seater trainer, with Gipsy Major engine– the prototype of the Fairey Primer, which made a name for itself in this country three or four years ago, and was the subject of an "In the Air" evaluation by the Editor in *Flight* of February 12th, 1948.

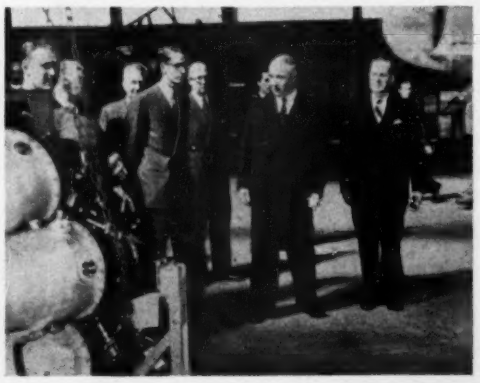
Flashback to 1908

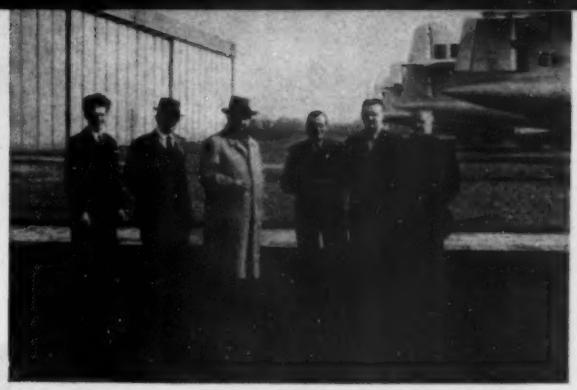
Aircraft design was no novelty to Mr. Tips, for as far back as 1908, in association with his brother, he had planned and built a biplane with twin, shaft-driven, reversible-pitch metal airscrews and a tricycle undercarriage. The engine was a 50 h.p. Gnome, for which the Tips brothers secured an agency covering Belgium and Holland. Later they developed a 35 h.p. "valveless" rotary of their own design, the crankcase and cylinders of which were a single casting. A rotary mixture-distributor fed ports in the detachable cylinder-heads. Larger models of 50 h.p. and 80 h.p. were also constructed.

Development of these engaging projects was arrested by the outbreak of the Kaiser's war, whereupon Mr. Tips joined the Belgian Army. After escaping from enemy occupied territory he made his way to England in 1915 and was given charge of the erecting department of the Fairey Aviation Company at Hamble. Thus began a 37-year-old association with the English company, during which he made valuable technical contributions and participated in numerous test flights of prototype aircraft with Capt. Norman MacMillan and other well-remembered pilots.

As already recorded, he helped in the establishment of the

The occasion of the visit of H.R.H. Prince Baudouin of Belgium—the present King—to the Avions Fairey factory last May. From left to right are: Mr. Maurice Tips, Major Tollet, Prince Baudouin, General Leboutte, D.F.C., Mr. E. O. Tips, and Mr. R. Coniot.





Avions Fairey personalities: Left to right, Martin Tips, A. G. Vreedenburgh (who joined Mr. Tips at Fairey's Hayes factory in 1915), E. O. Tips, H. C. Freeman, Maurice Tips and R. Conlot.

Avions Fairey company in 1931, but his work at Gosselies was brought to an abrupt standstill at 5 a.m. on May 10th, 1940, when German bombers flattened most of the buildings and left behind them sufficient delayed-action bombs to put paid to the few remaining. The company's staff nevertheless managed to salvage a useful quantity of equipment and records, which they loaded on 30 or 40 trucks and headed south, with the idea of starting up afresh near Bordeaux. The state of affairs on arrival, however, prompted Mr. Tips to move his equipage across to England; so the material from Gosselies was shipped aboard a collier at Nantes and the staff secured a passage on the Cunarder *Lancastria*, lying at Saint Nazaire. But hardly had the liner cleared the harbour when she was dive-bombed and sunk. Eight of the Avions Fairey staff were drowned, but the others were rescued and brought safely to Devonport by the destroyer *Havelock*.

So it was that Mr. Tips became experimental manager and chief engineer of the Burtonwood Repair Depot of the Ministry of Aircraft Production, under the Controller, Major C. H. Chichester Smith, who today is one of the assistant managing directors of The Fairey Aviation Co. in England. Mr. Tips was responsible for modifying strange American aircraft for which, in most instances, the drawings and tools had to be improvised. He left the depot in 1943, when the U.S.A.F. took over, and once again joined Faireys, where he was chief experimental and research engineer until 1945.

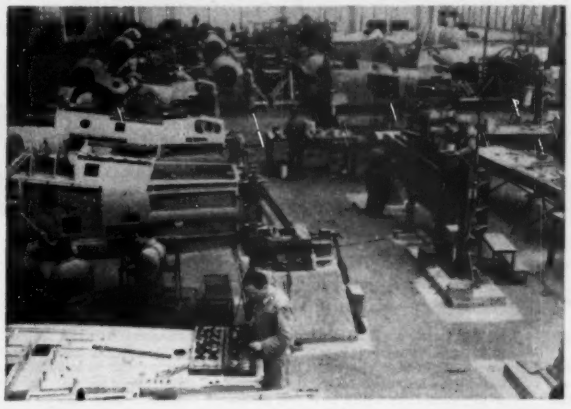
Upon the liberation of Belgium he returned to the Gosselies factory and found it a mere shell. The Germans had temporarily reconstructed the hangars and used them as workshops for Me 110 repairs; but looters had left little else but bare walls.

Before abandoning the factory in the face of the German advance in 1940 Mr. Tips had caused the major components for six of his machines to be hidden on the top floor of a local factory; but again his luck was out, for someone had given the game away in 1944 and the Germans had collected, assembled and flown the little monoplanes for their amusement.

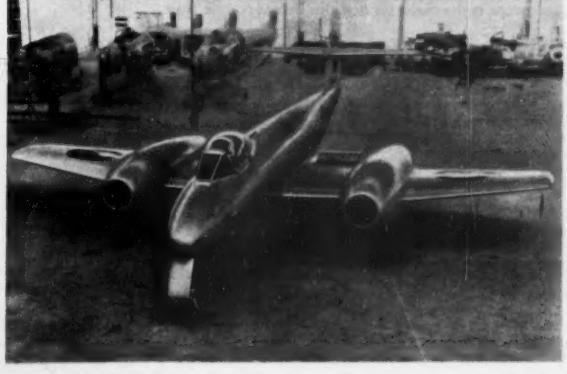
Scarcity of building materials and other handicaps notwithstanding the works were reopened during October, 1946, and Mr. Tips gathered around him the nucleus of his old staff, having in prospect receipt of military contracts. Pending the placing of these —until the middle of last year, in fact—the principal activity was the repair and overhaul of civil and military aircraft, and over 200 Service machines, including Tiger Moths, Ansons, Dominies, Dakotas, Harvards, Spitfires, Meteors and Mosquitoes, had been dealt with up to the beginning of this year. For civil operators a number of Ju 52s, Fiesseler Storchs, Piper Cubs and Fairchilds were repaired and overhauled.

Meantime, production went ahead on a modest scale—seven Belfairs and two Juniors having been delivered during 1946-48. (The Junior was a post-war single-seater with a very spritely performance on extremely low horse-power.) It was on one of the Belfairs that Mr. Van Cotthem broke the world's record for the under-500 kg class with a flight of 945 km—a record which no longer stands, though plans are in hand at Gosselies for its ultimate recapture.

Factory space was extended considerably during 1950 and 1951, and the staff has been correspondingly and progressively increased to cope with the greatly expanded business.



Front-fuselage assembly jigs in one of the new Gosselies workshops. (Below) The first Meteor assembled at Gosselies for the Belgian Air Force.



The Meteor Contract

In December, 1950, a contract for Gloster Meteor Mk 8 intercepters for the Belgian Air Force was in prospect, and Avions Fairey was successful in being appointed sub-contractors, in the first place to Gloster and secondly to Fokker, for the production on an assembly basis of these aircraft for the Belgian Government.

Work on the Meteor contract began in July, 1951, and at the time of our visit a few weeks ago six machines had been completed. Of standard Mk 8 pattern, they are fitted with Rolls-Royce Derwent 8s made by the Fabrique Nationale factory at Liège—which, we were reminded by G/C. L. C. Slee, D.S.O., D.F.C., the British Air Attaché in Brussels, is not the nationalized concern that its name suggests.

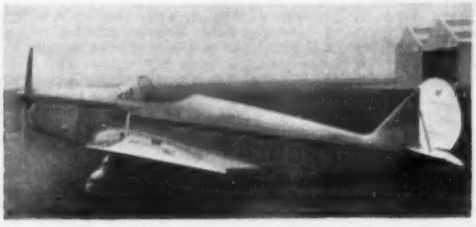
No divergence from standard British practice is to be observed on the Meteors, except that the V.H.F. sets are of Belgian type: even the labels in the cockpit are printed in English, for the fact is increasingly apparent that English is the language of the air. The labels, incidentally, are of aluminium, anodically blackened and engraved, so that the lettering cannot be erased by wear during service.

In the planning of the new works, Mr. Tips, assisted by Mr. H. C. Freeman (works' manager) and by his own sons, Mr. Martin Tips (assistant works' manager) and Mr Maurice Tips (manager, technical department), had full scope. Everything appears to have been laid out for order and speed: the compressed-air system and electrical supplies are tidily disposed, and in place of the traditional battered wooden work-benches are stout metal structures with tubular legs. Track trucks and overhead cranes help the components on their way to the assembly bay. Fuselages are assembled on one side of the shop and the wing centre-sections, ailerons, etc., on the other. Though the buildings are not remarkable for their dimensions, there is no obstruction to movement. Complete sets of parts for particular jobs are delivered from stores on dozens of standardized trolleys, and all man-handling in the shops is thus eliminated. Views of the shops herewith convey more of the scene than could any verbal account.

Some replanning of the buildings has been necessary because a new by-pass road is to be brought through the area; but there is no natural obstacle to hinder future expansion. The airfield belongs to the company itself and the runway is being renewed

Model of the Tips brothers' 1908 biplane, with v.p. airscrews.

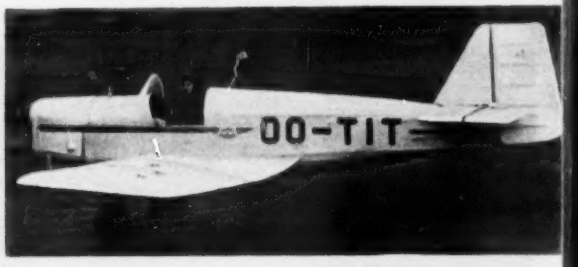
The dainty little Tipsy S.2, which came to England during 1936.



The Tipsy Model B open two-seater, forerunner of the Belfair.

The Tipsy Model M trainer, known in England as the Primer.

Seen at the Brussels Show in 1950—the trim-looking Belfair.



The most recent Tipsy seen in England—the single-seat Junior.

AVIONS FAIREY COMES OF AGE . . .

and extended to 1,800yd with open approaches. It is hoped next year to increase it to 2,400 yards.

Test-flying is in the hands of Belgian Air Force pilots—among whom the senior is Major Dieu—under the supervision of Colonel Legrand, who himself participates in the flying. The Meteor squadrons, we learned, are concentrated at Beauvechain and Chievres.

Apart from the Meteors in the Gosselies shops we saw Spitfire 14s, Harvards and a Dakota—the latter in process of receiving cameras for a Congo survey; and in the experimental department we were allowed to view (and, as a special privilege, to sit in) the mock-up of the Nipper—newest and tiniest of the Tipsys. Having promised Mr. Tips not to divulge constructional details until he gives the word, we shall confine ourselves to remarking that this is to be an all-wood single-seater having a Volkswagen engine and a nosewheel undercarriage. The largest components will be less than 8ft long, and the fuselage and mainplanes are arranged to fold. The ultra-light fraternity have our assurance that the Nipper will be something quite out of the ordinary.

But as we drove back through the battlefield of Waterloo, a few miles out of Gosselies on the Brussels road, our thoughts were of sterner matters. In that sombre place it seemed plain sense that the Meteors we had seen coming through the Gosselies shops should quickly be succeeded on the line by something newer and even better-fitted for first-line defence of the West.

ONE-SOLUTION PRE-TREATMENT PRIMER

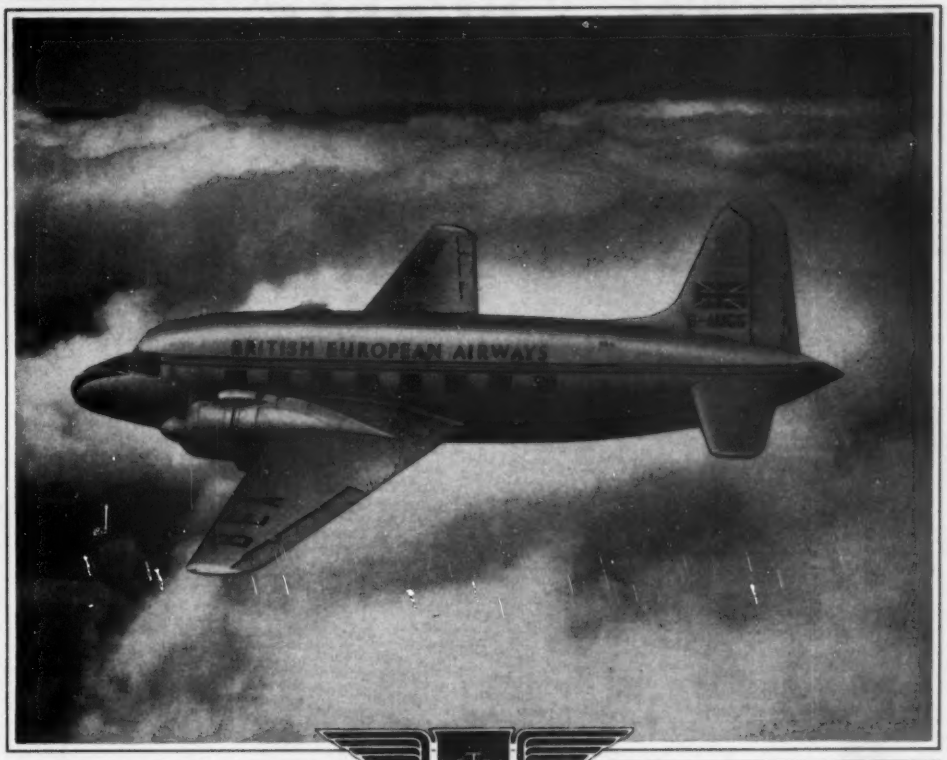
KNOWN as "1-4-2 primer," a new aircraft preparation has been marketed by Cellon, Ltd. The firm's pre-treatment primer has now been in use for some four years and can be applied to any surface which has been de-greased. To date, it has been available only in the form of two solutions which required mixing immediately prior to application, resulting in a short "pot-life." This drawback has been overcome with the 1-4-2 primer, which is supplied as a single solution in normal tin containers, in which it can be stored for at least nine months. For spraying, addition of up to 20 per cent by volume of Cellon T.D.X. thinner—or an equivalent dope thinner—will give a solution which can be used repeatedly.

The recommended film of 0.4 to 0.6 oz/sq yd is claimed to combine full pre-treatment with high corrosion-resistance. Of particular advantage on cadmium-plated surfaces, the primer is approved to D.T.D. 900 and will shortly be available in brushing and dipping forms.

PROTECTION AGAINST MAINS-FAILURE

TWO prototype diesel generating-set installations have recently been produced by Workman, Reed, and Co., Ltd., of Hewish, Bristol. The first unit delivers 50-cycle single-phase current at 230 volts with a maximum loading of 6 kVA. Driven by a 10-b.h.p. Petter diesel, this equipment is now in service in a works airfield control-tower. It is fitted with automatic mains-failure control to enable the stand-by plant to start and take over the load immediately the mains supply fails. Further automatic control is fitted to start the generator when load makes a sufficient demand and to switch off whenever the load is removed, or when mains power is re-established.

A second installation has been designed for installation in the company's main office-block, in which the operation of automatic calculating and accounting machines might be seriously affected by power failures. This set is rated at 15 kVA and the vibrating-reed voltage regulation has been found to provide a steadier voltage than was obtainable from the mains.



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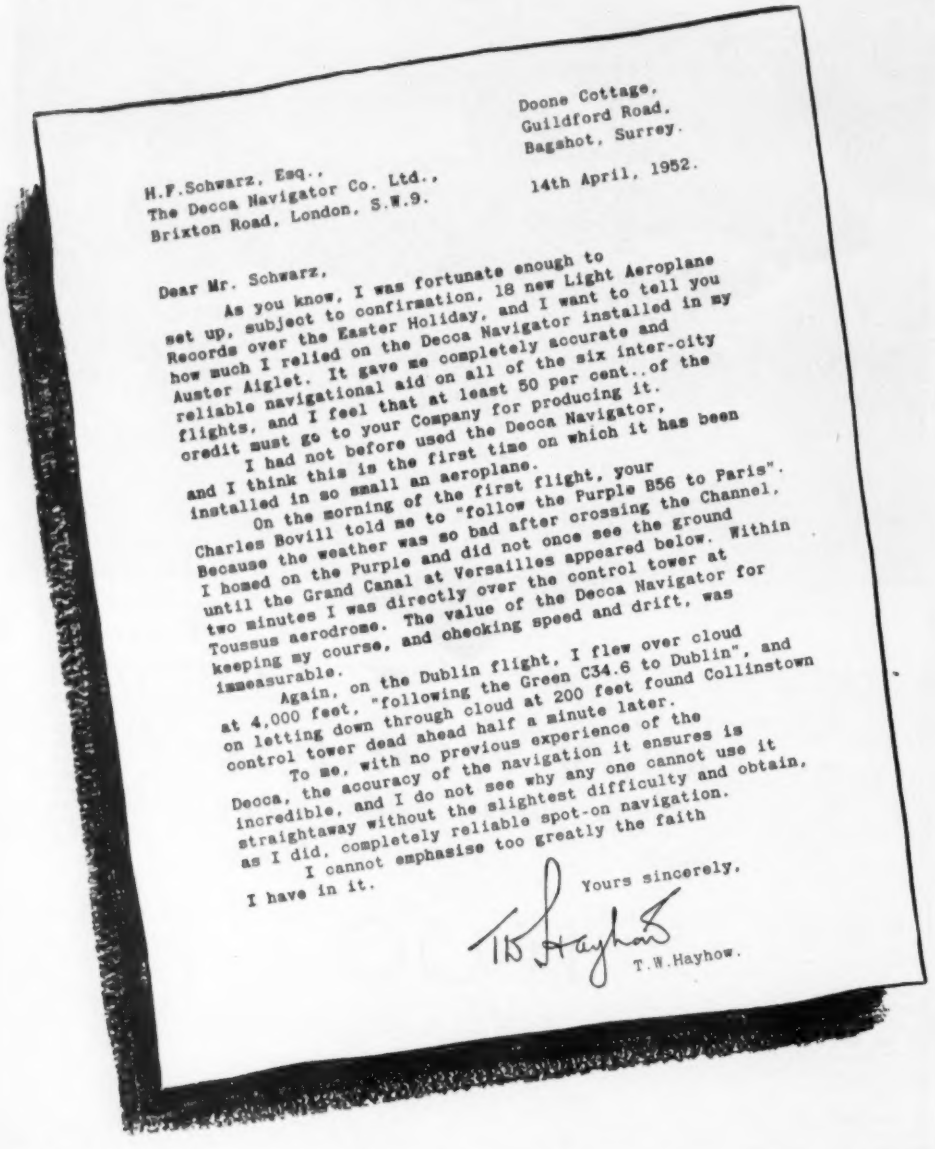

Doone Cottage,
Guildford Road,
Bagshot, Surrey.

H.F.Schwarz, Esq.,
The Decca Navigator Co. Ltd.,
Brixton Road, London, S.W.9.

14th April, 1952.

Dear Mr. Schwarz,

As you know, I was fortunate enough to set up, subject to confirmation, 18 new Light Aeroplane Records over the Easter Holiday, and I want to tell you how much I relied on the Decca Navigator installed in my Auster Aiglet. It gave me completely accurate and reliable navigational aid on all of the six inter-city flights, and I feel that at least 50 per cent. of the credit must go to your Company for producing it.

I had not before used the Decca Navigator, and I think this is the first time on which it has been installed in so small an aeroplane.

On the morning of the first flight, your Charles Bovill told me to "follow the Purple B56 to Paris". Because the weather was so bad after crossing the Channel, I homed on the Purple and did not once see the ground until the Grand Canal at Versailles appeared below. Within two minutes I was directly over the control tower at Toussus aerodrome. The value of the Decca Navigator for keeping my course, and checking speed and drift, was immeasurable.

Again, on the Dublin flight, I flew over cloud at 4,000 feet, "following the Green C34.6 to Dublin", and on letting down through cloud at 200 feet found Collinstown control tower dead ahead half a minute later.

To me, with no previous experience of the Decca, the accuracy of the navigation it ensures is incredible, and I do not see why any one cannot use it straightaway without the slightest difficulty and obtain, as I did, completely reliable spot-on navigation.

I cannot emphasise too greatly the faith I have in it.

Yours sincerely,

T.W.Hayhow.

The Decca Navigator Company, Limited

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MODERN FUEL SYSTEMS

Gas-turbine Installation Requirements: Mr. J. E. Walker's R.Ae.S. Lecture

IN a R.Ae.S. Main Lecture, given before the Luton Branch of the Society on April 24th, Mr. J. E. Walker, A.F.R.Ae.S. (chief power plant engineer, de Havilland Aircraft Co., Ltd.) dealt comprehensively with *Fuel Systems for Turbine-Engined Aircraft*, basing his discussion primarily upon experience obtained with the Comet. Introducing his paper, Mr. Walker said that, although its title suggested that turbine-engined aircraft required fuel systems fundamentally different from those of other aircraft, this was not entirely the case, and much of his material was applicable to piston-engined aircraft. Gas turbines did, however, make more exacting demands in certain aspects, while some relief was obtained by the use of less volatile fuels.

In the first major section of the lecture, Mr. Walker examined the characteristics of the turbine fuels most used in this country, namely, kerosine and wide-cut gasoline. More volatile gasolines were capable of being used in turbine engines, but were not specifically catered for in turbine-engined aircraft design, and if they were used as an expedient it would be with limitations on fuel system performance. Those characteristics of the two main turbine engine fuels affecting fuel system designs are given in Table I.

After discussing vapour pressure, the release of air from the fuel, and fuel freezing, the lecturer passed to the subject of water in fuel. Free water could be pumped in with the fuel, water in suspension could be carried in by dirt, water could condense in the fuel tanks, or water could be present in solution in the fuel. Little trouble had arisen from the two last-named causes, but the presence of free water constituted a serious menace which would lead to filter blockage by ice. Free water and water in suspension should both be avoided by the use of adequate separation and filtering facilities.

If the aircraft filters did become iced, this could be countered by providing a by-pass, heating the filter element, or by injecting an anti-freeze, such as methanol, upstream of the filter. A very suitable solution would be the provision of a solid anti-freeze insoluble in the fuel yet soluble in water. Chromium-trioxide had been suggested for this purpose, but it suffered from a characteristic of such substances, namely, reaction with rubber tank sealant.

The effect of fuel on fuel system components also had to be considered. The synthetic rubbers used in the construction of bag-tanks and seals were adversely affected by aromatic hydrocarbons, which were present in high proportion in the two turbine fuels considered. Similarly, unexpected corrosion effects had been met on metal parts from combinations of fuels and bag-tank materials, while the temptation to use magnesium had to be avoided wherever the metal might come into contact with water. Another factor brought into prominence by the use of capacitance-type fuel gauges was the permittivity of the fuel. Large variations in this factor made accurate fuel measurement difficult, and there appeared to be a good case for including values of permittivity in the fuel specification.

Mr. Walker then turned his attention to a consideration of fire risk and the explosive range of the fuels. The fire danger potential of the two fuels considered could be assessed from an examination of the pressure/temperature explosive range, the flash-point, and the spontaneous ignition temperature. Taking a fuel temperature range of +40 to −35 deg C, it would be seen from the envelope curves of Fig. 1 that kerosine would produce an explosive mixture in the tanks at the high temperatures, while wide-cut gasoline was dangerous at the lower temperatures. There was little doubt that for civil aircraft in flight kerosine was the safer, wide-cut gasoline in this respect being worse than ordinary aviation gasoline.

Under the heading of flash-point, Mr. Walker showed that the lower the fuel temperature dropped below 38 deg C (and it was seldom above this figure) the more difficult it became to start a kerosine fire, while wide-cut gasoline remained highly dangerous down to −23 deg C. The significance of this was that, in the event of a crash—unless this happened immediately after take-off in a hot climate—gasoline was ready to be ignited immediately, while kerosine required considerable heating to enable the flame to travel. This interval gave the crew and passengers in the crashed aircraft a chance to escape, and also gave fire-fighting crews a chance to extinguish the fire before it took control. This considerable safety advantage now offered to civil aircraft should not be lost by the use of higher volatility fuels.

TABLE I: TURBINE FUEL DATA

	Aviation Kerosine	Wide-cut gasoline
Test-fuel specification	——	RDE/F/KER/210
Bulk-fuel specification	DERD/2482	DERD/2486
Current American equivalent	MIL-F-5616 J.P.1	MIL-F-5624A J.P.4
Specific gravity (60 deg F)	0.79-0.83	0.739-0.825
Calorific value per lb	18,500 B.Th.U.	18,700 B.Th.U.
Calorific value per Imp gal	147,000 B.Th.U.	140,500 B.Th.U.
Volume coeffs. of expansion	0.00094/deg C	0.00094-0.00120/deg C
Reid vapour pressure	0.12 lb/sq in	2-3 lb/sq in
Dissolved air (S.L. equilibrium)*	14 per cent by vol	14-24 per cent by vol
Dissolved water at 20 deg C	0.006 per cent by wt	0.007 per cent by wt
Dissolved water at 50 deg C	0.026 per cent by wt	0.028 per cent by wt
Freezing point (initial)	−40 deg C (max)	−60 deg C (max)
Flash point	+38 deg C (min)	−14 to −23 deg C
Spontaneous ignition temp. (open steel place)†	650 deg C	650-720 deg C
Rate of flame propagation‡	App. 4ft/sec	App. 4ft/sec
Aromatics (by volume)	20 per cent (max)	25 per cent (max)
Sulphur content (by weight)	0.2 per cent (max)	0.4 per cent (max)
Kinematic viscosity at 0 deg F	6 Centistokes (max)	2 Centistokes (max)

* The air dissolved in fuels is slightly oxygen rich.

† The values of spontaneous ignition temperature are comparative only, varying with the test-method.

‡ The flame does not propagate at all below the lower limit of inflammability, i.e. at sea level, the flash point.

In his second major section, Mr. Walker dealt with detail design of a fuel system. It was generally realized, he said, that fuel pumps were not only required to supply fuel to the engine pump at sufficient pressure to prevent any vapour release in the feed system or engine pump where cavitation could occur, but also to provide the necessary agitation in a fuel tank to cause air to come out of solution in the fuel and escape from the tank vents before it could enter the fuel-pipe system. It was obvious from this consideration that pumps should not be installed in feed lines where there was no means of escape for such air and vapour. The particular characteristics of the pumps which were now generally used, whereby the delivery pressure fell to negligible proportions when the pump became uncovered, could be used to good advantage to reduce the unusable fuel in a tank to a minimum. In the Comet, fully submerged pumps could be switched on in one tank while the previously used tank was nearly empty, the pumps being left running to empty the tank as completely as possible without fear of forcing air into the feed system. Although full duplication of pumps was provided in the Comet, no pump failures had occurred, reflecting the ready co-operation of the makers in undertaking extensive tests under conditions simulating flight cycles. The use of gas turbine power-plants made the capacitance-type gauge mandatory, especially since modern aircraft tended to use large

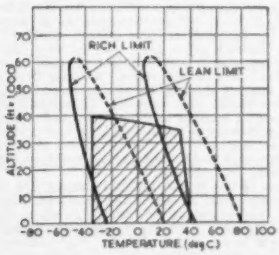


Fig. 1 (above). *Explosive limits of two turbine fuels. The left-hand loop refers to wide-cut gasoline and the other to kerosine with an R.V.P. of* 0.126. *The shaded area represents the fuel temperature-range measured during development flights on the Comet.*

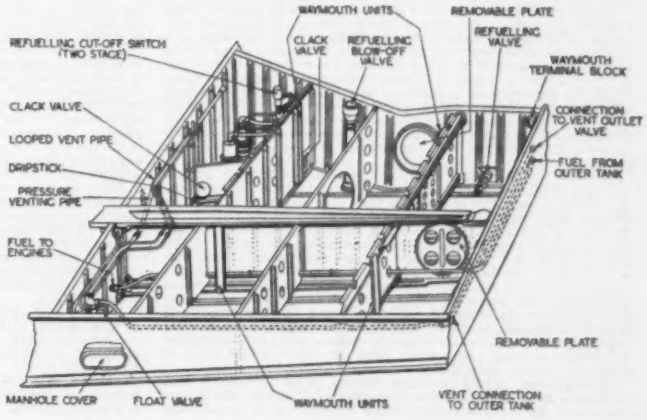


Fig. 2 (*right*). *Comet port inner tank.*

MODERN FUEL SYSTEMS...

shallow tanks with many baffles. Such gauges were useful in their present state, but would only begin to fulfil their true function when the maximum overall tolerance of accuracy under flight conditions could be kept within ±2 per cent, with ±½ per cent as the eventual aim.

The lecturer then discussed the mechanical details of fuel-system fittings, and pointed out that unions and fuel cocks should be provided with the full nominal bore. There also appeared to be great scope for the design of a light, flexible, fire-resistant hose which would obviate the necessity of making special end-fittings to suit a particular angle of take-away. The difficulty of making joints leak-proof against kerosine was well-known. In the lecturer's experience, considerable efforts had been made to find a flat-face seal remaining tight down to −40 deg C, and yet which did not squeeze out under the pressure of the joint when warm. Several solutions appeared possible based upon the principle of dropping a rubber sealing ring into a space into which it would fit so as just to prevent the rubber flowing.

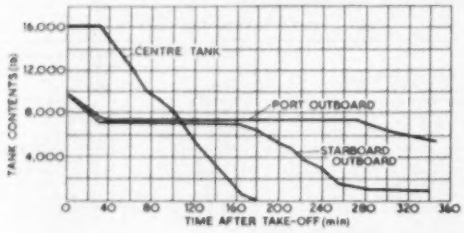


Fig. 3. Fuel in Comet G-ALVG during a flight on February 21st, 1950.

Mr. Walker then examined the factors governing the design of a suitable fuel system for a turbine-engined aircraft. The necessity of finding space in an aircraft for ever-greater quantities of fuel while reducing weight had led to the present practice of using the aircraft structure to contain the fuel, either directly by making spaces in the structure sealed compartments, or by lining these spaces with a thin-walled flexible bag, the self-contained rigid tank having been relegated to the outside of the aircraft in the form of wing-tip or pylon tanks. Much disappointment had been experienced with integral tanks, but if the right approach was made to the design, they could possibly give less trouble than any other form of tank. In particular, it was important that the basic structure should be dictated by the tank and the sealing problem in minute detail be given full consideration from the beginning of design. As a general principle, the designer should aim at achieving sealing without the aid of plastic sealant, such a sealant being a second line of defence only.

While bag tanks might be fitted where structural problems prohibited the use of integral tanks, they had further advantages in being unaffected by normal structural deflections and were possibly more resistant to failure in the case of a crash. But great care was necessary in the storage, handling and fitting of such bags, most leakage trouble being due to lack of care in such respects. Consideration had also to be given to venting in order to prevent pressure inside the bag falling below that in the tank compartment, to avoid the bag sucking in and putting heavy local strain on the attachments and forcing fuel out of the vent pipes. Equal care had to be accorded the design of the bag compartment to provide complete support for the tank within a smooth interior free from cutting edges. Methods of attachment of the bag had presented some difficulty in the past; Mr. Walker thought positive fixing studs attached to the structure from inside the bag provided the best solution.

In laying out the fuel system a principal point to be borne in mind was that the turbine was more particular than a piston engine with regard to the amount of air or vapour which could be delivered with the fuel. A suction feed could be dangerous, particularly at low levels, while a second cause of air in the feed line was either low pressure, or high line velocity and local restrictions in the pipe. Such effects could usually be eliminated by provision of tank booster pumps. The most difficult condition to be designed against was that of negative g, although the Comets, throughout their flying, had shown no need for such consideration, and on ground test the engines had regained normal running after the feed pipe had been opened to full air bleed for eight seconds.

The difficulty of feeding fuel from thin swept-back wings without incurring undue weight and complication needed careful consideration. In addition to providing at least two feeds from each tank to deal with different flight attitudes, complicated baffling was required to control the travel of fuel in the tanks. Venting and fuel pressure then became correspondingly complicated, and high loads due to fuel head could be imposed on the tank walls. It might be that a new method of feed, such as "squeezing" the fuel from a tank might be possible. The approach to the design of the fuel system for transport aircraft differed from that for fighters. The former should be as flexible in operation as possible, while the latter type of aircraft required a system fully automatic in all respects. This latter point unfortunately led to a growth of complication on an aircraft least able to take it, and the designer might well ask whether the steadily growing requirements were not defeating the object of producing a useful fighting unit.

Although vents should be simple stacking pipes they did, in fact, present the most difficult problem of the whole fuel system. Mr. Walker enumerated the conditions under which the vent had to operate, and said that the aim should be to achieve all the requirements with a simple pipe run, resorting to more complicated devices only when these were essential. Swept-back wing tank-systems could become extremely complicated due to the lack of any consistently high place in the tank from which the vent outlet could be taken.

In considering tank supercharging, it would be seen that while kerosine required no such pressure-rise to prevent boiling, wide-cut gasoline required up to 2½ lb/sq in to meet the conditions of reduced pressure at 50,000ft altitude and 45 deg C temperature. Civil aircraft could well do without the additional complication of a pressurized vent system unless it was justified as a means of emergency fuel feed or to increase jettison rate. On the other hand, military aircraft with high rates of descent demanded such rates of inward venting to the tanks; with non-supercharging, vent sizes became extremely difficult to accommodate without producing water traps and restrictions. Supercharge by air or inert gas was necessary in such cases where depression could not be permitted. The wing design, however, had to allow for the supercharge pressure, since this was additive to the normal wing surface suction pressure.

Although Mr. Walker admitted having little experience of the relative effectiveness of the various means of preventing tank explosion, he discussed the subject because, he said, previous efforts to find reasonable accommodation for such systems had been rather discouraging; but there was no case as yet to justify the fitting of tank protection on civil aircraft, particularly if kerosine was the fuel. After discussing several known methods of tank explosion prevention, the lecturer spoke of the R.A.E.-developed suppression system, which appeared to be a brilliantly conceived solution to a difficult problem. Much development was required, however, before it could be effectively installed in civil aircraft.

Refuelling the Comet [see *Flight*, February 1st, 1952] was controlled by valves developed by Flight Refuelling, Ltd., placed as low in the tank as possible, both so that the ingoing fuel did not agitate the surface of the tank when the tank was nearly full, and also so that the same valves could be used for off-loading. Two automatic cut-off levels were provided in this aircraft, the first operating when the tanks were nearly full, and the second after topping-up at a reduced fuelling rate; blow-off valves were also provided to guard against unserviceability of the cut-off switches. The greatest difficulty with automatic cut-off systems was to position the switch high enough in the tank. As with vents and fuel feeds, this problem was accentuated with shallow flat tanks and swept-back wings. A pressure-operated cut-off might be better than the float-operated switch, but it would be more difficult to control the air space at varying fuelling rates.

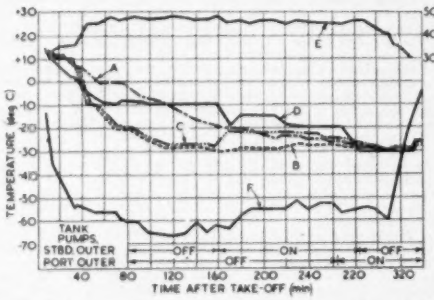


Fig. 4. Fuel temperatures during the flight to which Fig. 3 refers.

A — Port outer tank, 4in above chord-line.
B — Port outer tank, bottom.
C — Starboard outer tank, bottom.
D — Feed pipe to port engines.
E — True air speed.
F — Ambient air temperature.

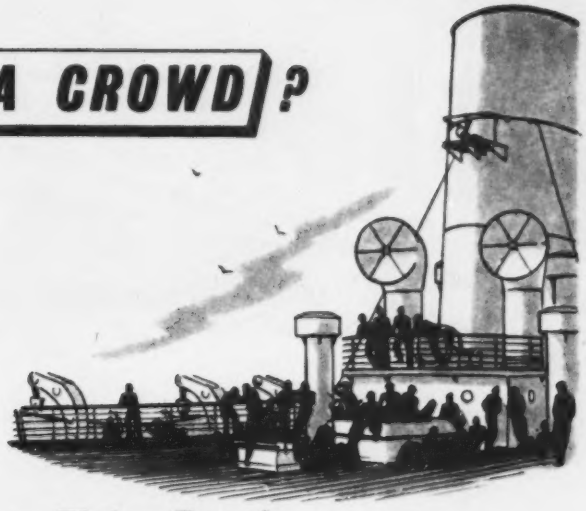
The final section of Mr. Walker's paper dealt with the very comprehensive testing which modern fuel systems required. It paid to do as much rig-testing as possible before the first flight. With the Comet, a small quarter-scale model was first made of the wing, with accurately positioned tank compartments roofed with Perspex. This should be supplemented with a full-scale rig rotating in the pitching and rolling planes. If the rig testing was thoroughly carried out, little time needed to be spent on the prototype aircraft before flight. It was unlikely, however, that all flight conditions could have been covered on the ground, and some flight testing was essential.

Much work had been done by the R.A.E. and Rolls-Royce, Ltd. in establishing the minimum temperature to which fuel would fall when operating at high altitudes. With respect to the warning shown by the results of these tests, no trouble had been experienced with Comets during their many hundreds of hours at high altitude. Fig. 3 showed the way in which fuel had been used during a flight in which careful measurements had been made of the wing skin and fuel temperature on the first Comet, the results of the fuel-temperature measurements being shown in Fig. 4.

It was to be hoped that these results would shortly be supplemented by those of other aircraft; it could be said that these tests were most carefully conducted, and could be taken as representing the conditions prevailing on this aircraft. Taking the absolute minimum permissible fuel temperature as −45 deg C, the Comet could fly in temperatures of down to −70 deg C. A lowering of the specification freeze-point of kerosine by 5 deg C or more would be a valuable contribution to operation at low temperatures.

WHEN IS ONE MAN

AS GOOD AS A CROWD?



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BRITAIN'S COMET

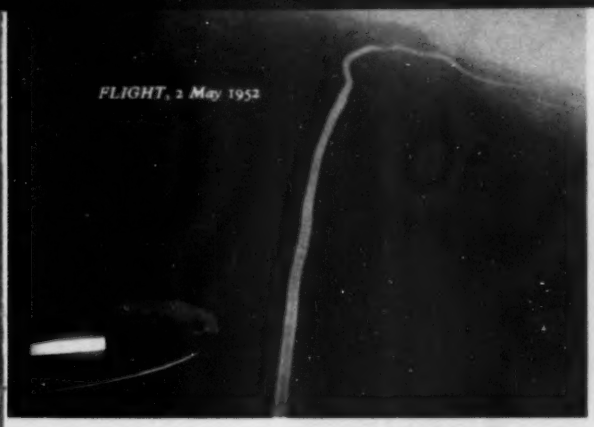
eight miles a minute, eight miles high
in the smooth, clear sky

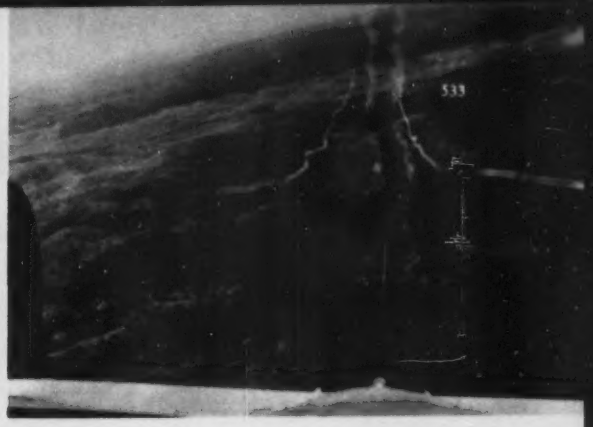
DE HAVILLAND

DH AIRCRAFT

DH ENGINES

Flight Photograph





THE WRITING IN THE SKY

THESE remarkable photographs—reproduced here without retouching—were taken during operations over Malaya by an R.A.F. Brigand squadron of the Far East Air Force. They are the work of S/L. R. B. Lord. For any student who finds it difficult to believe in the existence of wing-tip vortices, here is visual proof *par excellence*. The first picture above shows a clockwise vortex produced by the Brigand's port wing-tip in an almost vertical turn (note the fin and rudder) over the jungle; in the other are seen twin vortices and, more faintly between them, rocket trails left behind as the aircraft pulls out after attacking a bandit position. The waviness of the trails is caused by the bumpy air and by the Brigand's slipstream. On the right is seen another of the Brigands returning to base in line astern after the attack.

HELICOPTERS IN THE HOUSE

A SERIES of pertinent questions relating to military and civil helicopters was asked in the House of Commons on April 23rd. Mr. Fitzroy Maclean (Con., Lancaster) wanted to know what steps were being taken by the Air Minister to improve the supply of helicopters for use by British forces in Malaya.

Mr. George Ward, Under-Secretary for Air, replied that Lord De L'Isle and Dudley was fully alive to the potentialities of the helicopter for a wide variety of military purposes, and attached great importance to the early production of suitable types. He awaited a report from the Commanders-in-Chief in the Far East as to their requirements for additional machines.

A. Cdre. A. V. Harvey (Con., Macclesfield) asked Mr. Ward to state what was being done to increase production. He wondered if the Under-Secretary was aware that when the Parliamentary delegation visited Malaya 18 months ago, there was a crying demand for additional helicopters for saving life and facilitating operations. Would Mr. Ward go into this matter further?

Mr. Ward replied that he would, but said that, although the work of research and development on helicopters had made good progress in recent years, this type of aircraft was "really still in its infancy," and the types already being operated had "severe limitations."

This led Mr. Gerald Nabarro (Con., Kidderminster) to refer to the "incredible efficiency" of the helicopter, as demonstrated the previous day when Field-Marshal Sir William Slim landed at Chelsea Barracks to collect some documents left behind.

Questioning then switched to Mr. J. S. Maclay, the Minister of Civil Aviation, who was asked by Mr. N. N. Dodds (Lab., Dartford) what progress had been made in provision for the development of inter-city helicopter travel in view of the successful trial flights by the Bristol 173 twin-engined, twin-rotor helicopter.

Mr. Maclay replied that no production order for the 173 could be contemplated until the programme of basic research and development flying to be undertaken with the two prototypes was further advanced.

Mr. Dodds then asked the Minister if he was aware that the British aircraft industry stated that they could produce a helicopter almost for any purpose if necessary encouragement was given. Would the Government give that encouragement, and did they not appreciate that it took some time to prepare sites in cities? Further, was any progress being made on the South Bank?

Mr. Maclay repeated that it was clear that there must be extended research and development work before one could contemplate putting the helicopter into regular passenger use. Local authorities all over the country had been asked to earmark sites for future development. Later, he informed W/C. E. E. Bullus (Con., Wembley N.) that while one successful flight had been made from the South Bank, it was too early to make any statement on future developments.

Mr. Nabarro asked a further question as to how soon the Bristol 173 would be available for Birmingham to London regular fare-paying flights, and similar flights on a triangular service *via* Birmingham, Manchester and Liverpool.

Mr. Maclay said that while experimental commercial services on this route were contemplated when the 173 was ready for commercial use, a considerable amount of development flying had yet to be done before it could qualify for a C. of A. and services could be planned with any certainty.

Mr. Nabarro was dissatisfied, commenting that while the United Kingdom was leading the world in jet airliner development, with helicopters we were years behind the U.S., where thousands were in daily use.

Mr. Maclay maintained that there was bound to be a long process involved in the development of British helicopter types. Effective work had already been done, but experimental flying must take time. He assured Mr. John Rankin (Lab., Tradeston) that the possibilities of using helicopters on Scottish internal services would be kept in mind at all times.

There was some amusement when Mr. Maclay rejected a plea for substitution of the name "helidrome" for "airstop." He thought that "airstop" seemed both simple and appropriate, and he doubted if "helidrome" was technically the correct word.

Mr. Frank Beswick (Lab., Uxbridge) thought there should be general commendation when a Government department used good, short, descriptive Anglo-Saxon, which was much better than bastard Greek.

Prominent among these new pictures of the Vickers Varsity crew trainer is the splendid study below, with the Gothic spires of Lincoln Cathedral—landmark of the "bomber country"—as a background. This Varsity belongs to No. 201 Advanced Flying School, which is based at nearby Swinderby.

VARSITY IN THE R.A.F.

AS described in *Flight* last week, No. 201 Advanced Flying School has recently been re-equipped with the Vickers Valetta T.3 and—the subject of these studies by L. W. McLaren—Varsity T.1. Powered by two Bristol Hercules 264 engines (each delivering 2,100 h.p. for take-off), the Varsity has a high performance befitting its rôle as a trainer of future bomber crews—yet is sufficiently docile for relatively inexperienced pilots to fly it solo after a few hours' training.

Two student navigators may be carried in rearward-facing seats, and behind them is a third seat for an instructor. Gee and Rebecca navigation aids are provided, and there is a bombing position in the under-fuselage pannier, in the aft section of which there are racks for practice-bombs. The Varsity is slightly larger than its predecessor, the Valetta, and is also distinguished by its nosewheel undercarriage. It replaces an earlier Vickers-Armstrongs aircraft, the Wellington, which is still in service as a navigational trainer—though replacements are on the way.

FASTER, FARTHER, FAIRER— COMET II

IN flight or at rest, the Comet is a thing of beauty; and that it will prove a joy—if not, as Keats averred, for ever, then for a period of many years—is the reasoned belief not only of its constructors but of an increasing number of operators. In these new *Flight* studies of the Series II version, with Rolls-Royce Avons, the character of the machine is revealed to unprecedented advantage. Of 45 or more Comets bespoken by the Ministry of Supply, B.O.A.C., Canadian Pacific Airlines, Union Aéromaritime de Transport, Air France, the Royal Canadian Air Force, and British Commonwealth Pacific Airlines, 24 are Series IIs. Externally there is little to distinguish the new type from its Ghost-powered predecessor, though it will be observed that the air intakes are larger and of different shape, and that the tail-pipes (the inner is toed-out) of the Avons are not so widely separated as were those of the Ghosts.

ELIZABETHANS IN SERVICE

B.E.A.'s Newest Aircraft Introduced on Paris, Zurich, Vienna and Milan Routes

ALTHOUGH, financially, B.E.A. will not be extracting full value from the Elizabethans for many months, their introduction on some of the Corporation's Continental routes is already transforming the operational picture. Prestige and morale are being raised by the arrival of these competitive, comfortable and handsome aircraft. Since March 13th, they have been taking over a number of London-Paris services from Vikings; two of the 13 daily B.E.A. flights to Paris are made by the new airliners, and the proportion of re-equipped services on this route will be doubled on May 4th.

The first all-Elizabethan services, however, are on longer stage-lengths slightly better suited to the operating characteristics of the aircraft. Sunday, April 20th, marked the inauguration of daily Elizabethan services on two important routes: London-Zurich-Vienna and London-Milan. Members of *Flight*'s staff flew on both the inaugural services, and their personal impressions follow.

Not even the speed of the modern airliner (Comets excepted) can eliminate the need for an early start when the day's itinerary is London-Zurich-Vienna-Zurich-London. But the prospect of making the trip in B.E.A.'s Elizabethan G-ALZR *Sir Walter Raleigh* quickly dissipated our 6 a.m. Sunday lethargy, and the remaining cobwebs disappeared in the bright sunshine at London Airport. By then the time was 9.15. The two Centaurus 661s were quickly started under the observation of a "walkie-talkie" apron marshal. Taxying was very smooth, with no interruption of normal-voice cabin conversation. With 20 passengers aboard, the Elizabethan accelerated even more rapidly than usual and in about 25 seconds—at 0942 hr, some 22 min behind schedule—was quickly leaving the runway behind. Thirty minutes later the French coast was visible 19,500ft below through a rent in the blanket of stratus which had previously hidden our progress. At 1125 hr a note from the pilot, Capt. D. Hankin, D.F.C., told passengers that we were 20 minutes behind schedule, with 150 miles to run. About 90 miles from Kloten Airport, our destination, the Elizabethan began to shed height, and wheels were down some 20 minutes before the landing at 1214 hr. Visibility was good, but Capt. Hankin took the opportunity of giving his co-pilot, Capt. D. Ross, experience of making an I.L.S. approach at Kloten.

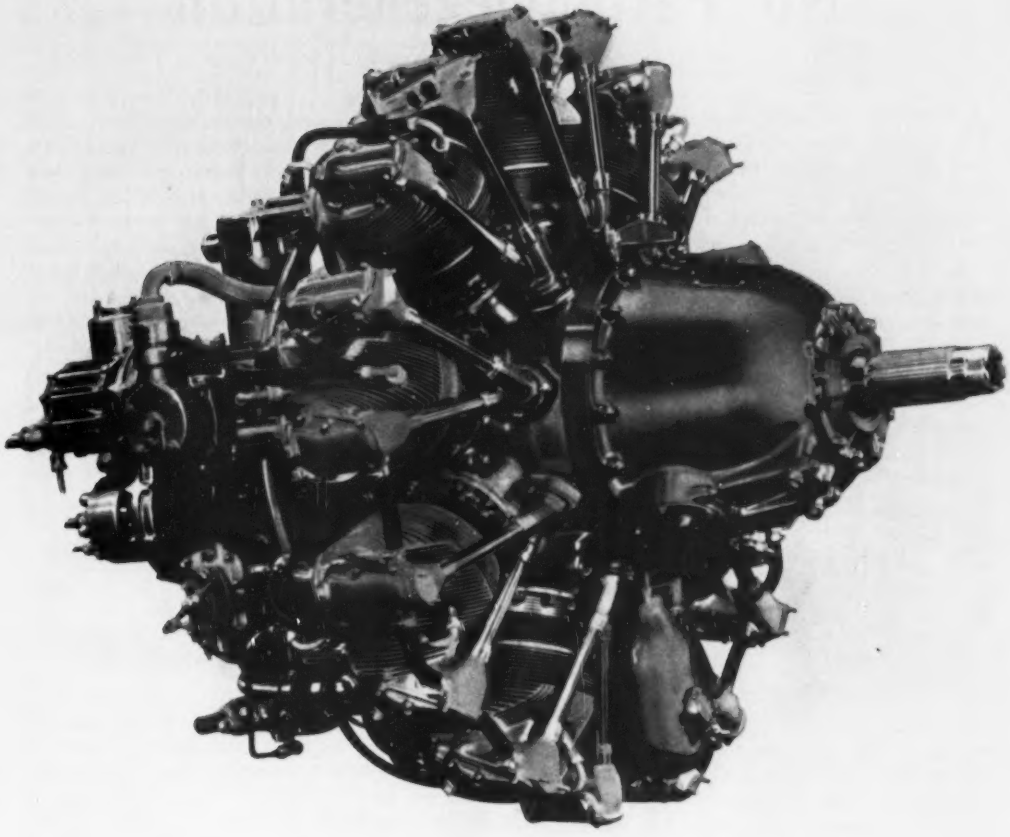
At the Zurich airport the new aircraft was the object of much interest among the crew of a Swissair Convair 240 standing nearby. The Convair is scheduled to take the same time as the Elizabethan on the London-Zurich route—2 hr 20 min. B.E.A.'s Vikings, which previously operated this route, were slower by 49 min, so the Corporation is only now able to offer a service comparable in time with that of Swissair.

Although our arrival was some 35 min behind schedule, we are assured that the delay was caused by the policy of conserving the engines during the early days of the new service. Cruising r.p.m. are at present limited to 1,900, which gave an output of 950 b.h.p. per Centaurus at 19,500ft during the first leg, and a consequently reduced cruising speed of 190 m.p.h. (there was also a 40-m.p.h. favourable wind component). At lower altitudes, as flown for the remaining legs, performance was higher; and there is a great reserve of power which will be fully utilized as the machine comes into its own. Cruising speed will eventually be over 270 m.p.h. on 1,300 h.p. per engine.

There were 36 passengers on the flight to Vienna, which began at 1325 hr, an hour behind schedule. The aircraft carried seats for 47 in the standard Elizabethan layout, but capacity on the Zurich, Vienna and Milan routes is provisionally limited (for non-technical reasons) to 40. At 15,000ft our speed was 236 m.p.h. (ground-speed 263 m.p.h.), which enabled *Sir Walter Raleigh* to land at Schwechat, Vienna, without any increase in our time-deficit.

Actual time of arrival was 1513, compared with 1413 in the time-table. It was significant that few passengers noticed the slight increase in sound-level and fairly pronounced deceleration of the Elizabethan when the reversible-pitch airscrews were used

(Left) "Sir Walter Raleigh" is loaded at Schwechat, the R.A.F. station which serves as a terminal for Vienna. (Below) Refuelling at Kloten, Zurich. The Elizabethans had already visited the Continental airports on their proving flights, and the ground crews were familiar with the detailed differences of technique necessary in handling. At each place a great deal of interest was shown both by the airport staffs and members of the public. "Flight" photographs



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No Fatty Degeneration

BY BERNARD HOLLOWOOD

A FEW years ago aircraft could make do on almost any good old grease. They took their fat ration, as it were, and asked no terribly awkward questions about corrosion, friction, consistency, mobility at low temperatures, resistance to water, resistance to separation and so on.

But times have changed. Modern aircraft are as choosey about their greases as they are about their fuels, lubricating oils and air hostesses. And for very good

reasons—(a) they have more powerful engines, (b) their airframe accessories operate at higher speeds, loads and temperatures, (c) they fly higher and through unheard-of temperature ranges (–60° C. to 100° C., for example).

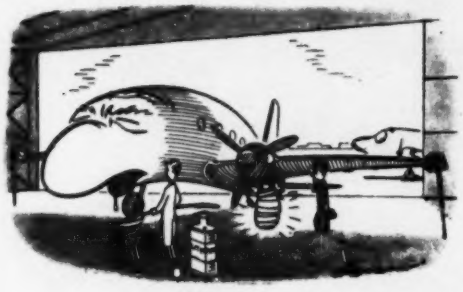
So better greases are essential. *Esso*lutely *esso*ntial!

Consider the case of landing-wheel bearings which are now (on braking) often invited to withstand momentarily temperatures of 150° C. and more after flying for several hours with the bearings held at temperatures of –30° C.

Well, heavily loaded bearings call for greases capable of maintaining what we copy-writers call a lubricating film. There must be no wear and tear, no leakage, no excessive friction and no loss of power. No fatty degeneration.

How are such greasy paragons produced? It's not so easy. Normal greases are simple mixtures of a lubricating oil and a certain type of soap, but special-agent greases are more than mere mélanges—they're the end-products of the finesse and know-how of an *esso*teric bunch of researchers. In the *Esso* labs., of course.

These wise-boys dabble with the conventional mineral oils, synthetic oils, and soaps based on sodium, calcium and lithium. In general, the sodium and calcium base greases handle the lubrication problems of aircraft equipment operating without the use of overmuch power, while the new lithium greases are particularly good performers at high temperatures. Lithium, I am happy to state, is a metallic element of the alkali group; and lithia-water has been known to relieve gout as well as the lubricating ills of modern aircraft—but that is by the way.



The number of greases used in the modern aircraft is . . . well, perhaps too many. The researchers in the *Esso* labs. are dead keen on rationalisation (repeat *Rationalisation*—with an "R") and live in hopes of reducing the number of greases to (say) three . . . or two . . . or even one. That would make life easier for a good many people, wouldn't it? For maintenance crews, aircraft designers and manufacturers, copy-writers and other old greasers—yes, and for the knotty-browed researchers. Anyway, they're hard at work improving the constituents of the mix, the lubricating fluid and the soap.

Meanwhile, gout or no gout . . .

It pays to say

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ELIZABETHANS IN SERVICE . . .

to shorten our landing-run at Schwechat. Here we said good-bye to Captains Hankin and Ross, R/Off. W. H. Miller, F/Eng. H. Rogers, Steward W. Crewe and Stewardess V. H. Wass; and G-ALZR was taken over by the slip-crew : Capt. H. J. King, D.F.C., D.F.M., 1st/Off. G. N. Cock, R/Off. T. T. Healy, Steward R. Goulding and Stewardess S. E. Rotger.

At 1610 hr we were again in the air. No Migs hove in sight over the Russian Zone, but further west two inquisitive F-84 Thunderjets came up to investigate. A few minutes later we obeyed the instruction "fasten belts" on entering some turbulent-looking cu-nim, but the Elizabethan gave us a characteristically smooth ride. Vibration is felt, incidentally, only on the climb—and then mainly in the seats between the engines. The passengers to whom we spoke agreed that the Elizabethan was excellent in every way. B.E.A.'s admirable standards of passenger-service are enhanced by the large and well-equipped galley for steward and stewardess, whose tasks could not have been performed better than they were during our flights.

We landed at Zurich at 1815 hr, now 50 min behind schedule. For the last section of the flight to London, the Elizabethan carried 29 passengers. Load-factors for the outward and return flights to Vienna therefore averaged, respectively, 70 and 61.25 per cent—proportions which will quickly increase as the summer season advances and this excellent service becomes better known.

G-ALZR took off at 1921 hr for the final leg, flying at 250 m.p.h. against a 40-m.p.h. wind. At 14,500ft, with engines running at 1,900 r.p.m. and 32in manifold-pressure, the torquemeters were reading 495 lb/sq in—equivalent to 1,200 h.p. per engine. We reached London Airport by 2205 hr—1 hr 25 min behind schedule. As mentioned, there should be no difficulty in maintaining or bettering schedules within a few weeks.

The Elizabethan performed admirably on its new services, and there is no doubt that it will fulfil B.E.A.'s high expectations.

Although slight delays in flight schedules are understandable, no excuse can be found for long delays on the ground. It was particularly aggravating, on our return to London Airport, to be detained for nearly 45 minutes, by formalities, and general hanging-about, before leaving by B.E.A. coach for Kensington Air Station. R. B.

Milan and Back

For the 620-mile trip to Milan, G-ALZV, *The Earl of Leicester*, was flown both ways by the same crew (Capt. W. Mackenzie, 1st/Off. G. R. D. Atherstone, Rad/Off. D. E. Flowers, Eng/Off. R. G. Henniker, Steward W. Currie and Stewardess Pat Lindsay). There were 33 passengers on board for the outward journey.

For reasons unconnected, we believe, with the aircraft, take-off from L.A.P. was 24 minutes after schedule. Apart from the lively initial climb—over 1,400 ft/min—the aspect of the Elizabethan which most immediately impressed the writer was the view which the high-wing arrangement affords; except for the odd York in

"Flight" photograph

Capt. D. Hankin (left), pilot of Elizabethan "Sir Walter Raleigh" on the inaugural services to Zurich and Vienna, is greeted on arrival at Schwechat by Mr. G. S. Parker, B.E.A.'s area manager for Austria.

war-time he had not flown in a high-wing airliner since 1939, and to one who seldom tires of ground-and-cloud gazing the change was indeed welcome. His other digested impressions of this elegant and spacious aircraft coincide with those of "R.B." above, so it would be superfluous to give them here.

Cruising at about 215 kt T.A.S. at 19,500ft with a 15 kt tail-wind, G-ALZV passed over Paris 55 min later. Then the cumulo-stratus closed in solidly below, fortunately breaking again an hour afterwards to reveal the brown and white majesty of the Swiss Alps—Jungfrau and Finsteraarhorn to port and the Monte Rosa chain to starboard. With the Swiss and Italian lakes for good measure, this must be one of Europe's most spectacular air routes.

And so, in 2 hr 54 min from London (7 min over the scheduled journey time), into Milan's Malpensa Airport for a thistledown landing; from the Elizabethan's window one can watch the tyre, a few feet away, kiss the concrete. On the apron was to be seen G-AMDB, B.E.A.'s Dart-Dakota, loading freight for London.

A rapid turn-round, a chat with Mr. D. J. Venters, B.E.A.'s station superintendent at Malpensa, and we were on our way home again, this time with 28 passengers. A wide circuit was necessary to gain height for the nearby Alps, and then G-ALZV, at 19,000ft, settled down for a journey as smooth and admirably conducted as the outward one had been.

Capt. Mackenzie started a long, gentle let-down at the French coast, to bring the Elizabethan into L.A.P. in 3 hr 3 min from take-off—in spite of a 20 kt head-wind, almost exactly the schedule flight-time in this direction. Not jet-like, perhaps, but a striking comparison with the Viking schedule of 5 hr 15 min. R.C.

COMFORT ALL THE WAY

NEW and larger motor coaches with capacities to match their latest aircraft are being introduced by B.E.A. for service between Kensington Air Station and Northolt and London Airport. The first of 50 which are on order was formally handed over to Mr. Peter Masefield, B.E.A.'s chief executive, by Sir Wavell Wakefield, M.P., chairman of Park Royal Vehicles, Ltd., the concern responsible for the bodywork of the new rolling stock.

Seating 37 passengers, compared with 18 carried in the vehicles they replace, the new coaches are larger—they are built to the maximum overall dimensions permitted on British roads (30ft. long by 8ft wide)—and of different design. They are also mounted on the latest type of coach chassis made by A.E.C., Ltd., and having a 125h.p. oil engine carried horizontally beneath the floor.

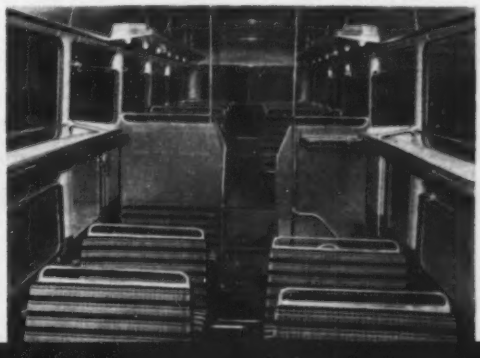
Although, as in the existing B.E.A. coaches, the seats are arranged at two different levels, with luggage accommodation under the rear floor, the roof level is maintained at the same height from end to end. The result is a more spacious interior, a larger window area, and a better-balanced appearance. The rubber-padded luggage-locker will take up to 100 full-sized suitcases.

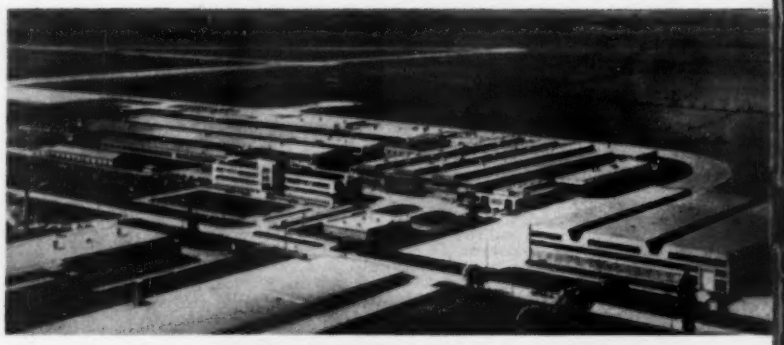
London Transport Executive engineers were called in to help B.E.A. in the design of the vehicle and their influence is noticeable in the seating and the interior finish adopted, which follows closely the style of the latest Green Line coaches while embodying the B.E.A. colour scheme of burgundy and dove grey. Wide seats with Dunlopillo cushions and squabs give adequate comfort. A heater unit supplies air to demist the screen and warm the interior of the coach through suitable ducting. The exterior is finished in two shades of grey with a white waist band bordered by polished aluminium mountings lined with burgundy red.

Speaking at a luncheon following the handing-over ceremony, Mr. Peter Masefield hinted that as B.E.A. traffic increased more coaches of the same pattern would be required. He estimated that the operating cost of the new vehicles would be 1.25d per seat-mile as compared with the 2.2d of typical turbine-powered airliners.

These exterior and interior views give a good idea of the ultra-modern appearance and general air of comfort of the new B.E.A. coaches.

"Flight" photographs





The main Avro Canada works, 15 miles from the centre of Toronto. The plant is on the far side of the main highway, with Malton Airport beyond.

Part III. The Avro Airframe and Gas Turbine Plants at Malton

By JAMES HAY STEVENS

CANADA'S AIRCRAFT INDUSTRY

THE two previous articles in this series (April 4th and 18th) gave the general picture of the Canadian aircraft industry as it is today. The author now goes on to describe the activities of the three main constructors, Avro, Canadair, and de Havilland; the first of these three—taken in alphabetical order—is the subject of the present article.

IT would be idle to deny that A. V. Roe Canada, Ltd., has suffered from growing pains, but these pains have had rather more than their fair share of publicity. Nevertheless, no critic can avoid the manifest fact that in the CF-100 with the Orenda engine Avro produced the first entirely Canadian aircraft; nor can it be denied that in the twin Malton plants near Toronto lies one of the greatest potentials of the Canadian aircraft industry.

In 1942 a Government company, Victory Aircraft, Ltd., took over the operation of the aircraft factory which, owned by the National Steel Car Corporation, Ltd., was to build Lancasters for the Department of Munitions and Supply. Arising out of their association in Lancaster manufacture, the Hawker Siddeley Aircraft Co., Ltd. (now the Hawker Siddeley Group) acquired the Malton factory in 1945 and the present company was formed with Sir Roy Dobson at its head and a nucleus staff of about 300. A year later Avros took over another Government company, Turbo-Research, Ltd., which had been formed two years earlier to keep Canada in the picture with turbine development. Having, in a sense, a dual interest in the new concern, the Canadian Government supported it with development orders for the CF-100, Chinook and Orenda. Trans-Canada Airlines also assisted in the private-venture Jetliner, both with moral support and the wealth of their airline experience.

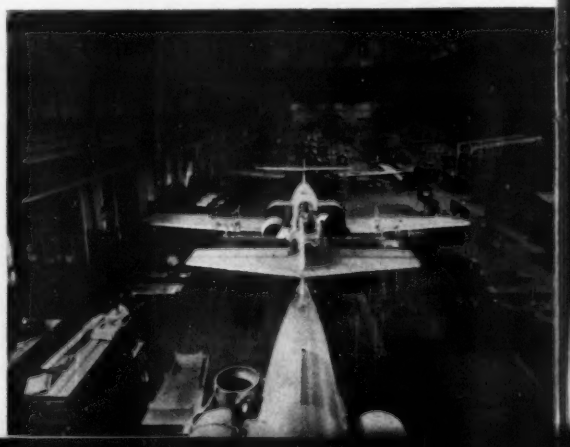
Progress with the prototypes of all four projects was rapid, and first results could scarcely have been better. The Chinook ran in March, 1948, and the Orenda in March, 1949, while the Jetliner flew on August 10th, 1949, and the CF-100 on January 19th, 1950. The performance of each was excellent: but the Jetliner was rather too early on the scene and could not be sold, finally being atrophied by re-armament; the first CF-100 to be delivered to the R.C.A.F. suffered a secondary structural failure in the wing when subjected to higher g than that for which it was designed; and the pilot-production Orendas encountered teething troubles that had not affected the prototype. These difficulties threw production preparations out of gear, so that the firm was harshly criticized in the Canadian Press for the number of its employees—now about 6,000—and its negligible results. There is no doubt that the Government's eagerness to get an all-Canadian fighter into service was at least partly to blame for an over-zealous rush from prototype to production.

Now, however, after a visit by Sir Roy Dobson late last year, there has been a general reorganization and, in particular, the Aircraft and Gas Turbine Divisions have been separated under the guiding control of the president and general manager, Crawford Gordon, Jun. The aircraft division is managed by Fred T. Smye, with Edgar H. Atkin as technical director, James C. Floyd (the Jetliner designer) as chief engineer, and Dennis E. Wiseman as works manager. For the gas-turbine division, Thomas S. McCrae was imported from the Allison Division of General Motors, together with his personal assistant Fred W. Lucker, to organize production of the Orenda in the new plant. The Orenda's designer, Paul B. Dilworth, remains chief engineer.

The present plant at Malton has plenty of floor area (over 1,000,000 sq ft) but is to some extent broken up under different roofs. It is obvious, when walking through, that there has been some difficulty in accommodating the varied work in hand—reconditioning Lancasters, building prototype airframes, making prototype turbines, and starting pre-production lines for the CF-100 and the Orenda. There is a bay full of the large machine-tools—vertical millers, gang broaches, profile grinders and outsize lathes—for the making of gas-turbine components. In another bay is the tail end of the line of ten pre-production CF-100s and the beginning of the real production line. When I visited Malton a couple of months ago, additional jigs for the main components were still being made in an adjoining bay. A great deal of space was occupied by the assembly stands and other work on the Orendas. When once this is finished and all engine-production activities transferred over the road to the new engine plant, the original factory will be laid out to take the CF-100 work, with only a small area reserved for experimental gas turbine manufacture.

The number of CF-100s ordered is a secret; it seems likely that they will be used only by the R.C.A.F., who are expected to increase their order. One would imagine that, if this is the case, the factory represents further airframe manufacturing potential.

It is, however, on the jet programme that Avro Canada is really concentrating. This is a joint venture with the Government, and the idea is to make the Orenda one of the major engines of the N.A.T.O. forces. The new factory, about a mile away from the old one, is a wonderful modern building. It is a vast rectangular structure, 440,000 sq ft in area, and completely windowless save for the offices on the north side. Except for these offices, also, it is entirely on one floor. The building is completely air-conditioned and artificially lit, so that working conditions will always be the same, summer or winter, day or night. At the southern end of the block are the production test-cells, furnaces and plant-maintenance buildings. As the factory was being completed this spring, the tool-room had started to operate and the first of the machine tools, large vertical millers, had arrived



Assembly line for the CF-100, some of the ten pre-production models of which are seen here. On the right are wing jigs.

and were standing, shrouded, waiting to be fixed in their places on the floor.

The immense size of this building is most impressive and its capacity for production must be very large indeed, for it should be remembered that more than half the detail work on the Orenda is sub-contracted to some *four hundred* individual firms. The aim is, of course, to establish the Orenda as an alternative power plant to the J-47 in the Sabre. If this installation proves successful—and the Orenda-Sabre has done a lot of flying—it opens up enormous possibilities. Also, if production of the Orenda builds up well toward the end of this year, or the beginning of 1953, it should do much to overcome the shortage of axials, particularly the J-47, that is beginning to cause worry in many quarters.

On the design side the Orenda is not static. The Solar Aircraft Company is developing an afterburner for it and trials of both thermal and alcohol de-icing are being conducted. This experimental work is carried out both in the new silenced test houses at Malton and in the ex-Government research establishment at Nobel in the hills a hundred miles north of Toronto, where compressors and combustion chambers can blare away without disturbing anyone.

Another aspect of Avro's activities has been an intensive development programme on new tools and shop processes. Members of the staff are encouraged to try out new ideas, and the firm then patents the process, giving the inventor an interest in his work. The pantograph tracer for reproducing turbine blade profiles is an example of native tool-design.

Indicative of the scale of equipment at Avro's is the fact that it is one of the few aircraft firms using an "electronic brain"—the I.B.M. Card Progressing Calculator; this is used for such varied work as turbine-blade calculations, flutter matrix solutions, and P.A.Y.E. deductions!

The conclusion one reaches about Avro's is that the firm has met with all the troubles common to a very rapid expansion from an individualistic unit of a few hundred people to an organization

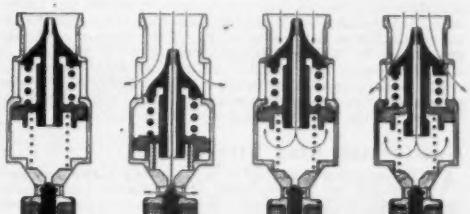
A recent photograph of the new gas-turbine plant, which covers nearly 500,000 sq ft. In the foreground are partly completed test-cells.

of 6,000 in only five years. Initial design, possible in a small firm, was excellent, but the transition to production and the passing over of original work to new personnel has been difficult and has led to delays that had not been foreseen. Certainly an extensive training scheme for new staff was undertaken, but this must have occupied the time of many of the original team. Now, however, the company is off to a new start and if the re-organizing has been sound it will be one of the greatest engine/airframe companies in the world. Only results can give the true assessment of worth.

(*To be continued*)

COMET FUELLING VALVE

As described in *Flight* of February 1st, 1952, the de Havilland Comet has a more advanced fuel system than any airliner at present in service; in particular, transfer rates for both refuelling and dumping are higher than elsewhere. Both refuelling and jettisoning are carried out along common pipes and automatic shut-off and relief valves are provided. These valves have been developed by Flight Refuelling, Ltd., specifically for the Comet. The operating solenoid is controlled by a float-switch, but additional switches enable selective filling of certain tanks to take place.



Operational sequence in the F.R. Mk 12 valve.

Known as the F.R. Mk 12, the filling-valve operates in the sequence shown in the accompanying drawings. In the static condition (a) the solenoid is de-energized. The light return spring holds the rubber sealing ring against the step machined in the barrel, thus preventing condensation and the ingress of foreign matter into the tank. Before fuel can enter the tank, the solenoid must be energized (b); it then unseats the plunger, permitting fuel to flow into the lower chamber through the hollow valve stem and out into the tank. Should the solenoid current cease to flow—e.g. by the action of a manual or float switch, or through electrical failure—the solenoid plunger is seated by its spring, and pressure is built up in the lower chamber, thus lifting the piston to close the valve (c).

To prevent dangerous pressure build-up at shut-down, a relief spring is placed between the piston body and crown (d). In the Comet tanks, this operates at 36 to 38 lb/sq in; normal delivery is at 30 lb/sq in. Current consumption is 0.3 amp at 24 V.

THE DOMINANT FACTOR

Few roles are more difficult to play than that of prophet. Already the theories of Clausewitz and Mahan have fallen before the new weapon of air power, of which Major Seversky is the supreme prophet; and one can only wonder if his beliefs as expressed in his excellent book* (now published in this British edition) will stand better the test of time. Shall we, in fact, see even bigger bombers than the B-36, automatically flown and defended, attacking targets with atomic-headed V.2s, and manned by crews who fight their battle from an armoured control room in the heart of the aircraft? Will such aircraft, if they exist, be atomic-engined flying boats? Or will Seversky's big bombers be made unnecessary by development of ultra long-range jet-fighters carrying baby atomic bombs and, later, by small, expendable, highly-accurate pilotless bombers?

One thing is certain—unless we take heed of Major Seversky's present warning that air power, and air power alone, can save the Western world from the threat of annihilation by Russia, the answer to those other questions may be purely academic, because we shall not be here to find out! Nor should we place too much faith in the atomic bomb to scare off our potential enemies. Seversky made a study for the U.S. Government of the effects of atomic and high-explosive bombs dropped on Japan and Germany during World War II, and his conclusions will disillusion any who regard A-bombs as the ultimate weapon.

* "*Air Power: Key to Survival*," by *Alexander P. de Seversky* (*with a Foreword by Air Chief Marshal Sir Philip Joubert de la Ferté*). *Herbert Jenkins, Ltd.*, 3 *Duke of York Street, London S.W.1. Illustrated.* 21*s*.

AIRSCREW WITH A NEW TWIST

Three views of the new modified Fairey-Reed metal airscrew, with reduced-thickness "flat" hub, for the Blackburn and General Aircraft Cirrus Bombardier (*see page 459, Flight, April 18th*).

THE INDUSTRY

D.H. Annual Report

A DOCUMENT both instructive and beautifully produced (with colour and half-tone illustrations) is the 32nd annual report of the de Havilland Aircraft Co., Ltd. It has been circulated to shareholders in advance of the annual general meeting, which takes place on May 20th.

As announced in *Flight* of March 28th, the net profit of the group, as compared with the previous year, has increased to £1,773,594 from £1,071,101, after provision for all charges except U.K. and Dominion taxation. It is proposed to pay a 7½ per cent dividend (less tax) on £2,740,912 of Ordinary Stock and at 1¼ per cent on £1,664,547 of Ordinary Stock for the year ended September 30th last.

In the chairman's address, printed in the report, an interesting reference is made to the D.H 110. Performance of this machine, it is stated, is "very high indeed," and is exceeding expectations. It is foreseen that the type will be capable of considerable development in both performance and versatility, and that its variants may well fill several operational rôles, as have the Mosquito, Vampire and Venom.

Handley Page Appointments

FOLLOWING the recent reorganization of the technical department of Handley Page, Ltd., six re-appointments have been made. The technicians concerned are Messrs. C. F. Joy, G. H Lee, R. H. Sandifer, C. O. Vernon, F. Tyson and K. C. Pratt. Their new posts, and the degrees, etc., which they hold, are given in the caption to their portraits below.

Mr. Joy has been Handley Page's assistant chief designer since 1947, having joined the company eight years ago as assistant chief draughtsman. Previously, he was with A. W. Hawksley (1941-44), Gloster (1940-41), and Armstrong Whitworth Aircraft (1927-40).

Mr. Lee joined Handley Page's in 1937, following a post-graduate aeronautics course at Imperial College and two-and-a-half years with Saunders-Roe (1934-37). In 1940 he was in charge of development of the "Manx" flying wing and later was appointed research engineer. He became chief aerodynamicist in 1949.

Mr. Sandifer joined the firm in 1927 after spending two years with Boulton-Paul Aircraft (1925-27) and was appointed chief stressman in 1939. During the past 25 years he has been associated with the design of eight production and five experimental types of H.P. aircraft.

Mr. Vernon, a "Silver C" glider pilot, has been connected with the aerodynamics department since completing his apprenticeship with the company in 1935. He was appointed deputy chief of the aerodynamics department in 1949.

Mr. Tyson, after taking a mathematics degree at Cambridge, went to the Fairey company's technical office in 1935, and spent a year on the technical staff of C. W. Aircraft, Slough, before joining Handley Page's stress office in 1938. He was appointed assistant chief stressman in 1947.

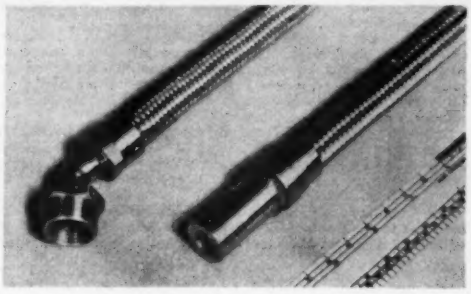
Mr. Pratt joined Handley Page, Ltd., in 1934 and worked in the experimental department until 1938. He has been in charge of the test department since 1939

The subjects of the Handley Page appointments (see above) and the posts which they will occupy. (Left to right) C.F. Joy, A.F.R.Ae.S., deputy chief designer; G. H. Lee, A.R.C.S., B.Sc., D.I.C., F.R.Ae.S., assistant chief designer, aerodynamics; R. H. Sandifer, F.R.Ae.S., assistant chief designer, structures; C. O. Vernon, A.F.R.Ae.S., chief aerodynamicist; F. Tyson, B.A., A.F.R.Ae.S., chief stressman; K. C. Pratt, A.M.I.Mech.E., A.F.R.Ae.S., development and test engineer.

Stainless-steel Flexible Piping

MODERN aircraft power-plants are increasingly demanding the use of flexible hose with greater resistance to corrosive fluids at both lower and higher temperatures than can be obtained with ordinary synthetic-rubber hose. One of the most highly developed flexible-hose systems to meet these stringent requirements is the range of metallic assemblies manufactured by Avica Equipment, Ltd. (Avica Works, London N.7).

This equipment is based on an electrically welded lightweight metal cored tube, convoluted into what is known as a "sylphon" form to provide greater flexibility. Over this core is wrapped either one or two layers of wire braiding to give the required mechanical strength and pressure-resistance. End couplings of a variety of types can be provided in light alloy, mild steel, stainless steel or brass.



Avica standard-type SM.1 45-deg. angle coupling, and type SM coupling fitted with stand-pipe end.

It is stated that such piping, in stainless steel, can be used in ambient temperatures of up to 350 deg C without ill effect. Working pressure is largely dependent upon whether one or two braids are specified, but will normally be up to 700 lb/sq in (corresponding bursting pressure 7,000 lb/sq in).

One of the most important applications for such hose is the transmission of various fuels and oxidants in rockets and guided missiles. Other installations include the passage of water/methanol, hot air and use as engine drain-pipes. More stringent conditions are offered by engine cartridge-starter lines—in which, it is claimed, no other hose available can meet the requirements.

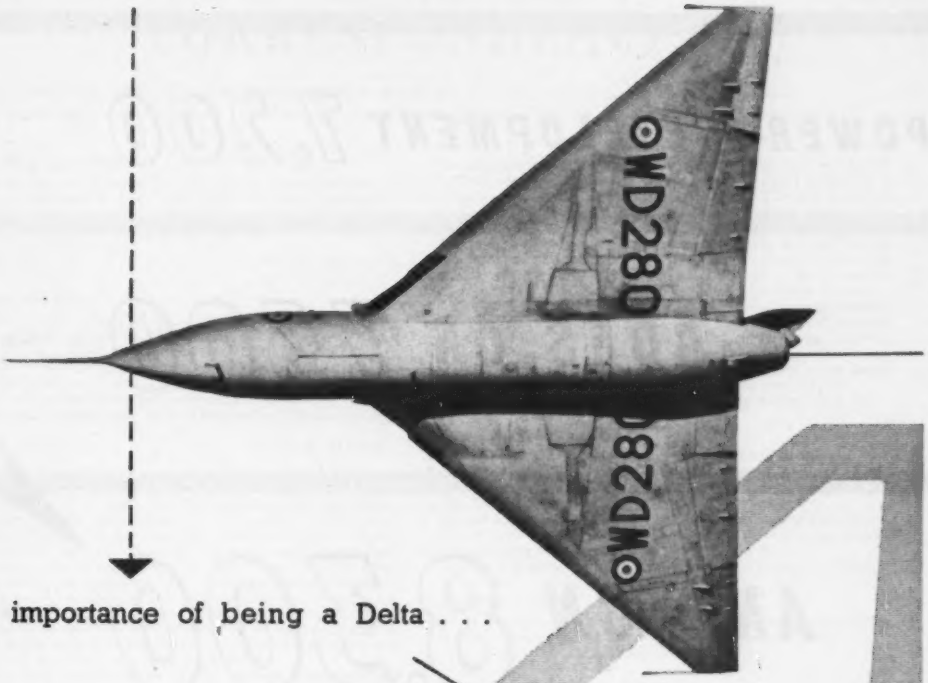
The Avica company has issued a booklet describing the hose assemblies; it lists the range currently available and also includes guidance on the installation and care of the hose.

Gas-turbine Ring Stretcher

A NEW special-purpose tool is the "segmental sizing machine" developed by Daniel Smith, Ltd., Castle Iron Works, Wolverhampton. This apparatus is primarily used for stretching the stiffener-rings commonly employed in aircraft gas-turbines, both to bring the ring to exact size without distortion and also to provide a simple tensile test of the weld.

A centrally mounted vertical pneumatic ram is employed to force a carefully profiled cam into the central orifice between a set of radial segments. The segments are moved radially outward, rapidly at first, until their outer periphery meets the ring under test; the movement is then progressively arrested until, at full diameter, a period of dwell is provided to allow for ring elasticity.

The expansion is adjustable from zero up to $\frac{1}{8}$ in, while air consumption of about 1½ cu ft per cycle is quoted; the maximum thrust is stated to be about 15 tons.



The importance of being a Delta . . .

To-day, recognition is steadily growing throughout the aviation world that the Delta is the aircraft design of the future . . . the logical airframe to give better performance at higher altitudes over long ranges at greater speeds. It is significant that A. V. Roe has already achieved many scores of flying hours on the Delta planform with their 707 A & B Deltas. Such practical experience is the true source of future progress and world leadership.

AVRO DELTA

A. V. ROE & COMPANY LIMITED, MANCHESTER

MEMBER OF THE HAWKER SIDDELEY GROUP

PIONEER . . . AND WORLD LEADER IN AVIATION

POWER DEVELOPMENT 7,200 LB THRUST

GOES ON 7,500 LB THRUST

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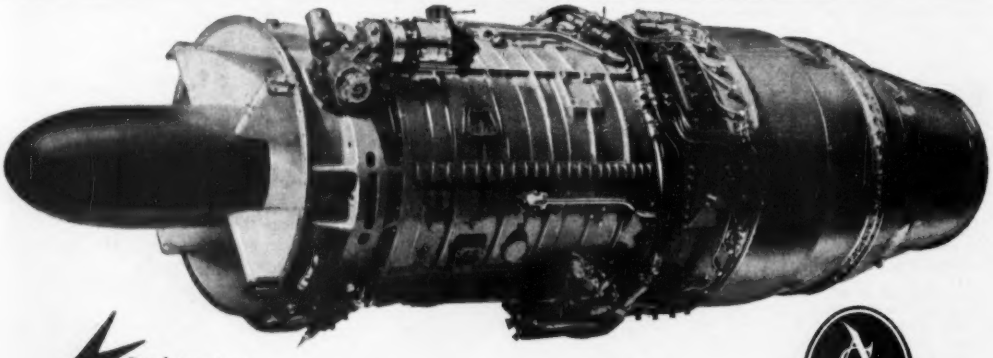


Development continues on the Sapphire which has now been officially Type Tested at a rating of 8,300 lb. thrust. It is the most powerful Type Tested engine in the world

SAPPHIRE

ARMSTRONG SIDDELEY MOTORS LTD

PARKSIDE, COVENTRY

Members of the Hawker Siddeley Group

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Which Goes to Show . . .

THE gentlemen who made the film *Angels One Five* must be laughing themselves sick. That R.A.F. types themselves cannot recall accurately war-time procedure and conditions seems to be indicated by your correspondence.

I wish I hadn't started it!

London, W.1. ALEX THORNE.

In Touch by Air?

WITH reference to Mr. B. J. Hurren's letter (*Flight*, April 18th), his slogan "Emigrate, and Still be in Touch by Air" is true—for those who can afford the fare; but does Mr. Hurren think that the average person emigrating to Canada can afford to pay for return visits to this country? I should think that for the majority of people emigration does mean severance, in spite of the fact that it took Mr. Hurren only 10 hr 4 min to fly to Montreal from London.

London, S.W.12. JOAN E. PLAYLE.

Tandem-wing Layouts

I WAS interested to read the letter on the Delanne fighter published in your April 11th issue. You will no doubt recall the Miles Libellula, which was also a tandem-winged aircraft, although in this case the wings were a good deal farther apart longitudinally, and the reverse in size. The forward wing was one-third the area of the rear wing, and carried approximately 40 per cent of the a.u.w., depending upon the c.g. position. By using the tandem-wing arrangement it was possible to reduce the overall dimensions of the machine very appreciably as compared with an orthodox layout, and extensive flight trials showed that there was apparently no penalty in respect of performance.

The handling characteristics of the machine were perfectly normal and, due to the loading of the forward wing being higher than that of the rear wing, the latter never stalled, and thus there was never any tendency to drop a wing at the stall.

The c.g. range obtainable with the tandem-wing layout was quite remarkable, and altogether the machine should have been very successful for the several purposes for which it was proposed, ranging from a ship-borne fighter to a high speed bomber.

Farnborough, Hants. D. L. BROWN.

Living History

YOUR editorial of April 11th entitled "Brave Days of Old" is very interesting and makes at least three important points.

The first shows the obvious desirability of all interested in the historical side of aviation to get together.

The second is your recognition, if only half-hearted, of the "number of small associations and individuals engaged in collecting . . . historical data." I hope others like myself will write in; then you will see they deserve quite serious consideration.

The third point is the surprisingly sudden realization of the deficiencies of our museums. Owing to lack of historical fact some exhibits are inaccurate. For example, the Spitfire in the Imperial War Museum, labelled "Battle of Britain," is in 1942 camouflage; also, the S.E.5A in the Science Museum, which, after service in a civil capacity has been "put back" in what is supposed to be 1918 war-paint. Would it be out of place to mention the inaccuracy of those appalling "decorations" in the entrance of the Aeronautical Section of the Science Museum? I understand they were done by inexperienced art students with no aeronautical background.

I thought that by stating the extent of my own records, others might be encouraged to come out into the open as well, thus forming a basis for co-operation.

My own records cover from February, 1913, to the present day, which is the period of the whole history of the Air Force except for the first ten months. It all started by accident when I saw a B.E.2 force-land near my home. This aircraft, I believe, must have been the one piloted by Capt. Becke when No. 2 Squadron took nine flying days to fly from Farnborough to Montrose. By good fortune I lived in a part of the country rich in aeronautical history during the First World War and almost on top of a large aerodrome. I thus saw all but three types of R.F.C. and R.N.A.S. aircraft.

I also saw all types of non-rigid airships from S.S. class onwards and nearly all "rigids" from R.23 onwards. Being an incurable scale-modeller, I recorded all types seen and began collecting samples of fabric so that my models should be accurately coloured. Today I have at least one sample of every colour used by the R.F.C., R.N.A.S., R.A.F., F.A.A.; also, I have a complete set of colours used by the U.S.A.A.F. in Europe and a little French and Italian of both wars.

By 1935 I found that others were producing and publishing good plans of current types of aircraft, but nobody was doing anything about colours beyond verbal description. So it was for that reason that I have stressed the colour side of my records.

Of enemy aircraft, I have examined personally many crashes and captured specimens, making 39 exact colour matchings myself of the Luftwaffe and nine of the Italian Air Force, together with camouflage charts, squadron markings, etc.

This work has recently been arranged on uniform pages ready for binding and takes the form of an illustrated manuscript.

Radlett, Herts. C. RUPERT MOORE, A.R.C.A.

Sartorial Shortcomings

IS it not about time that something was done to improve the quality of the R.A.F. uniform? The present uniform of the British aircraftman is a sad contrast with that of his counterpart in the United States Air Force.

In this age of speed and development in the mechanical sphere, is the dress of the airman to be left outdated, an object for ridicule and jest by the members of more fortunate air forces?

Chertsey, Surrey. PETER J. DAVIS.

Clerihew Corner

HOW pleasant and informative it was to read Mr. Don Brown's erudite exposition in this column on March 21st; but

How wrong
Of Don
To be so witty
Re the Brabazon Committee.

Yet we all agree

That he was well within his rights
To rub their noses
In the dust. And remind us of the Israelites
And Moses.

Little Rissington, Glos. MICHAEL H. BEECHING, F/L., R.A.F.

IN BRIEF

Mr. A. R. Goode (270 Gillett Road, Edgbaston, Birmingham 16) writes to say that he has a number of 1940 issues of *Flight* which he is willing to pass on to other readers free of charge. Dates are: January 4th, 11th and 18th; all February; March 7th, 21st; April 11th, 25th; May 23rd, 30th; June 6th, 13th, 20th; and July 4th. Some have had the advertisement pages extracted.

FORTHCOMING EVENTS

May 3. Vintage Aeroplane Club: Rally, White Waltham.
May 3-11. F.A.I.: Committee Meetings, Madrid.
May 5. I.A.T.A.: Fifth Annual Technical Conference, Copenhagen.
May 5-16. British Industries Fair.
May 10. Exeter Aero Club: Display.
May 10-11. l'Association des Amis de l'Aumoneries de l'Air: Rally.
May 17. Wolverhampton Aero Club: Goodyear Trophy Race and Display.
May 18. Northamptonshire Aero Club: At Home, Sywell.
May 21. Aircraft Recognition Society: Contest, London.
May 22. Aero-Club du Dauphiné: Air Meeting, Grenoble.
May 22. Aéro-Club de France: Coupe Stamm (helicopters).
May 23. Aircraft Golfing Society: Annual Dinner.
May 24-25. Ragozine-Auster Trophy Navigation Competition, Rearsby.
May 29. R.Ae.S.: Fortieth Wilbur Wright Memorial Lecture: "Prophecy and Achievement in Aeronautics," by Sir Harry M. Garner C.B., M.A., F.R.Ae.S.
May 30-June 2. Model-flying team contest, Belgium v. Great Britain, Namur
May 31-June 2. Aero-Club de Cannes: International Rally.
June 2. S.S.A.F.A.: Air Display, Yeadon, Leeds.
June 4-14. Third Mechanical Handling Exhibition, Olympia, London.
June 6-8. Aero Club d'Italie: Air Circuit of Sicily.
June 7-8. Yorkshire Aeroplane Club: International Invitation Rally, Sherburn-in-Elmet.
June 8. R.A.F. Golfing Society: Match v. Air Ministry G.S.
June 14. Girl Guides Association: Air Ranger Flying Pageant, Sywell, Northampton.

CIVIL AVIATION

BI-LATERAL: Scots pipers were waiting at Turnhouse, Edinburgh, to welcome DC-3 "St. Colmcille" on April 20th when it inaugurated the new Aer Lingus service from Dublin. A new Dublin-Cardiff service began the same day.

B.O.A.C.'s PROFIT

SIR MILES THOMAS revealed on April 23rd that the operating profit made by B.O.A.C. during the financial year which ended on March 31st was over £250,000. The Corporation's first profit, he said, had come about through "hard, aggressively fought business"; a good deal of it was dollar revenue. Sir Miles said that by balancing its figures "on the door-step of the jet-age" B.O.A.C. had given a great tonic to its staff and aircrews. He hoped that the Comet service to Johannesburg, due to start today, would be extended to Singapore about July.

INDEPENDENT'S BETTER PROSPECTS

IN its review* of associate services flown by independent operators during 1951, the Air Transport Advisory Council concludes that although the scope of such services is limited under the present arrangements, they have been "of considerable benefit to the public in that they have carried 91,000 passengers, the greater number of whom would not have been catered for by the Airways Corporations." On the basis of the past year's experience, however, A.T.A.C. feels that the independent companies will require longer tenures of agreement and better opportunities of operating on an economic basis before they will seek an increase in the number of their scheduled services. Such opportunities have, in fact, been promised by the Minister of Civil Aviation.

The Minister, Mr. John Maclay, states in a foreword to the A.T.A.C. report: "The review of civil air service policy which I am now undertaking has among its objectives increased opportunities for independent companies. . . . In the meantime, and in order to allow time for policy to be formulated, I have asked the Council to continue to consider applications in accordance with my predecessor's directive, but to limit all new agreements to one year." He also endorses the Council's recommendation that the number of documents and other formalities imposed on air passengers should be reduced to the minimum.

As in previous years, the Council devoted most of its time during 1951 to considering and making recommendations on applications to operate scheduled services in association with one or other of the Corporations. The total of such applications was 149, of which 117 (100 scheduled services and 17 inclusive tours) were recommended for approval—44 for five years, 16 for two years and 57 for one year or less. The reasons for rejecting the 32 unsuccessful applications were normally one or more of the following: (i) the proposed service was competitive with B.E.A.'s actual or planned service; (ii) the applicant was not considered satisfactory for the route; (iii) the route had already been allocated to another company; (iv) the service would, contrary to bi-lateral agreement, have encroached on the routes of Aer Lingus.

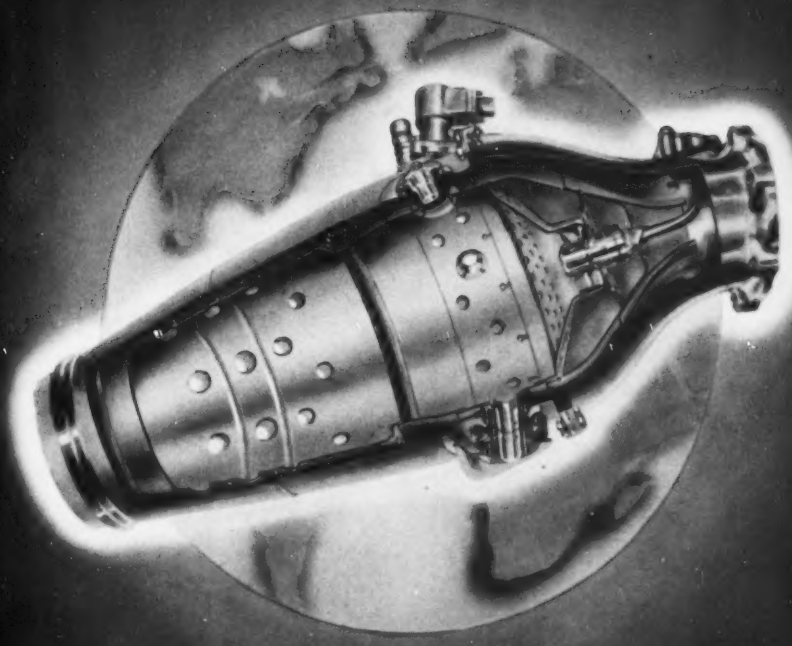
Noting that the Minister of Civil Aviation accepted all its recommendations, the Council expresses concern that out of 111 services finally approved only 42 were eventually operated. Although there were a number of contributory reasons, notably the severe shortage of aircrews and aircraft in 1951, the main single reason for withdrawals was that in the case of a number of applications (particularly those submitted by the Lancashire Aircraft Corporation and Scottish Airlines) only a part of the network or routes applied for could be recommended. The Council's report adds that as the character of the services thus curtailed (due to possible confliction with B.E.A. services), was to a considerable extent changed, it was not, perhaps, surprising that the companies found the modified arrangement unattractive. Examples of such routes were those between London and Manchester, Leeds, Blackpool, Liverpool, Newcastle and Land's End, which the Lancas'ire Aircraft Corporation had applied to operate. The council felt unable, however, to recommend all the routes for the full five-year period stipulated by L.A.C., which eventually withdrew its application—although operation of these routes became a matter of urgency by July, 1951. A need also arose during the year for associate services to supplement B.E.A.'s scheduled flight on the Channel Islands routes. Although an additional 2,250 passengers were carried to the Channel Islands by peak-period associate services, some of the companies which applied to work on these routes were unable to undertake all the proposed services. The council expresses concern with certain of B.E.A.'s booking arrangements for their Channel Islands services and also with the "ineffective procedure" for referring intending passengers to the associate companies when the Corporation's services were fully booked.

Referring to the increase of 25,000 on the total of 66,000 passengers carried during 1950, the A.T.A.C. report states that it was due mainly to the success of the Silver City Airways' ferry between Lympne and Le Touquet, which carried over 8,500 cars and 30,000 passengers during 1951. Nearly half the total traffic on associate services was on international routes. The other outstanding contribution was made by Aquila Airways, with its service from Southampton to Madeira. The number of passengers carried by associate services to the Isle of Man decreased to 24,000 from 45,000 in 1950; this was due largely to the fact that B.E.A. took over the Manchester-Isle of Man route last year. Passengers carried to the Channel Islands by associate companies totalled 14,000—nearly twice the 1950 figure. On the few associate services on cross-country and ferry routes within the U.K. the number of passengers was only 10,628, of whom some 6,000 were carried by Scottish Airlines between Prestwick and

* *The Fourth Report of the Air Transport Advisory Council. Published by Her Majesty's Stationery Office. Price 5d.*

BRIGHT AND SPACIOUS: The Brazilian claim that Galeao Airport, Rio de Janeiro, is one of the most modern in the world seems fully borne out by this photograph. The new reception and administration buildings, completed within six months, match the spectacular post-war expansion of civil aviation in Brazil.

A BURNING PROBLEM



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CIVIL AVIATION . . .

Northolt *via* Burtonwood. In considering the 81 applications to operate further scheduled services which were received up to the end of 1951, the Council has been guided by Mr. Maclay's request that agreements should not be approved for periods extending beyond March 31st, 1953. It is proposed to reserve until the next report comments on the application for services to be operated during 1952.

During 1951 the A.T.A.C. also gave to the Minister of Civil Aviation their recommendations on three of the nine complaints received from the public; they referred to (i) the irritation caused by repeatedly filling up forms in transit; (ii) the possibility of displaying "no tipping" notices at all airports and (iii) the need for informing passengers at Jersey Airport as to the reason and length of delays. The latter complaint was referred to B.E.A., who have now installed notice-boards at all their stations in the U.K., including Jersey. The first is within the scope of I.C.A.O., which is now taking action on an international scale to reduce formalities, and the second is at present being considered by the M.C.A., in conjunction with the trade union concerned.

Government policy towards the independent operators is now being formulated, and an announcement in the House of Commons is expected before Whitsun. Meanwhile, it would be idle to speculate on the extent to which the present method of arranging domestic services will be re-formed.

LORD DOUGLAS SUMS UP

SPEAKING in New York to a press conference sponsored by the Helicopter Council, Lord Douglas of Kirtleside, chairman of B.E.A., expressed confidence that "before long" the Corporation would be operating scheduled London-Paris services with 40/50-seat helicopters. Referring to his tour of the American aircraft industry, he said that he had not seen flying the type of helicopter B.E.A. wanted, but that there was a Piasecki military design, now on the drawing-board, which would fit requirements. This twin-engined, twin-rotor helicopter—with a fuselage of Convair 240 proportions—is expected to fly before the end of 1952. British manufacturers are known to be studying the B.E.A. specification, but only one design has so far been announced—the Bristol 181.

PANAM'S JET REQUIREMENTS

ACCORDING to *American Aviation*, Pan American Airways will buy jet transports "on the foreign market" if necessary, to meet B.O.A.C. and other forthcoming competition. Pan Am feel that it is time for an American manufacturer to offer to build a specific jet-transport design for a given price and with a reasonable guarantee of delivery dates. Our contemporary quotes the Boeing Airplane Company's "realistic" estimate of the time it would take to deliver a new American jet transport: Detailed specification and mock-up, nine months; construction of prototype, two years; evaluation and certification, two years; first production aircraft, two-and-a-half years. In the light of this estimate, Mr. C. R. Smith's forecast (see page 526) could only just be realized—*if* the rumoured Lockheed and Douglas jet-transport designs are two years from the first-flight stage.

There can be no doubt that the Comet—in developed, Avon-powered form—has a place in the jet-transport picture as envisaged by P.A.A. It would certainly fit many of the provisional PanAm requirements, which include: Cruising speeds in the Mach 0.85-0.95 range (an Avon-Comet with 30,000 lb total thrust might cruise at some 530 m.p.h. at 40,000ft—or M = 0.82); low-wing design; Sleeperette-type accommodation for 50-60 passengers (this requirement could be met by the reported "Series III" Comet with some 10ft extra fuselage-length). P.A.A. also feel that the jet airliner should be as near as is practicable to conventional design, with a landing speed not greatly exceeding those of aircraft now in use. The Comet's ability to meet both these conditions is, of course, one of its basic design-features. Its chances as a contender for American contracts are enhanced by continued absence of a competitive U.S. design and, possibly, by the recent refusal of the Senate Appropriations Committee to approve funds for construction of a prototype jet airliner.

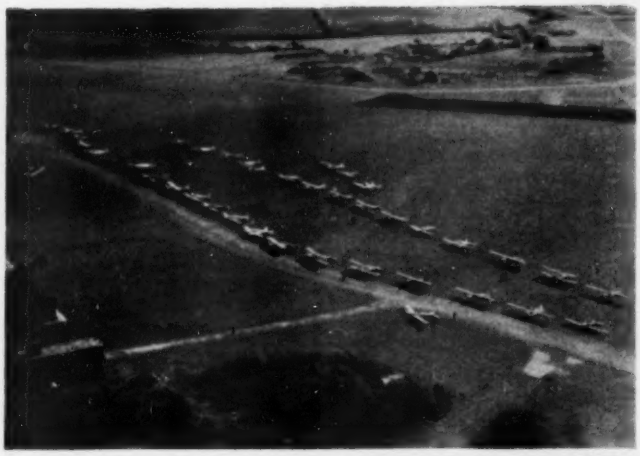
INDEPENDENT OPERATIONS: CURRENT ASSOCIATE AGREEMENTS

Operator	Route	Period of Agreement	Aircraft
Air Enterprises, Ltd.	Croydon-Sandown ...	1.5.50-30.4.52 ...	D.H.89
Air Kruise (Kent), Ltd.	Lympne-Le Touquet ...	15.4.51-31.3.53 ...	D.H.89
	Lympne-Ostend ...	1.4.52-15.10.52 ...	D.H.89
Airlines (Jersey), Ltd.	Jersey-Gatwick Guernsey-Gatwick	14.6.52-13.9.52 ...	D.H.89
	Jersey and/or Guernsey-Exeter-Plymouth ...	1.4.52-31.3.53 ...	D.H.89
	Jersey and/or Guernsey-St. Brieve-Lannion-Morlaix-Brest	1.3.52-31.3.53 ...	D.H.89
	Jersey and/or Guernsey-Dinard-Nantes (day trip and 24 hour inclusive tours only)	1.4.52-31.3.53 ...	D.H.89
	Jersey and/or Guernsey-Rennes and La Baule		
	Jersey and/or Guernsey-Caen, Deauville and Paris	—— 31.3.53 ...	D.H.89
	Jersey and/or Guernsey-Bournemouth (possible extension to Oxford) ...	—— 31.3.53 ...	D.H.89
	Jersey-Southampton Guernsey-Southampton	14.6.52-13.9.52 ...	D.H.89
	Manchester-Coventry-Bournemouth	—— ——	D.H.89
Aquila Airways, Ltd.	Southampton-Madeira Lisbon-Madeira	1.1.51-31.12.55	Short Hythe and Solent
	Madeira-Las Palmas ...	5.1.52-31.3.53 (after 5.7.52 subject to Spanish Government approval)	
	Southampton-Marseilles	1.5.52-31.10.52	
Birkett Air Service, Ltd.	Croydon-Alderney ...	—— ——	D.H.89
	Croydon-Guernsey ...	—— ——	D.H.89
	Croydon-Jersey ...	—— ——	D.H.89
	Guernsey-Dinard ...	2.7.52-19.9.52 ...	D.H.89
Cambrian Air Services, Ltd.	Liverpool-Cardiff-Southampton-Guernsey-Jersey	9.4.51-8.4.56 ...	D.H.89
	Cardiff-Weston ...	1.1.52-31.3.53 ...	D.H.89
	Cardiff-Haverfordwest	—— ——	D.H.89
	Cardiff-Bristol ...	1.4.51-31.3.56 ...	D.H.89
Don Everall (Aviation), Ltd.	Birmingham-(Guernsey)-Jersey	31.5.52-27.9.52 ...	D.H.89

Operator	Route	Period of Agreement	Aircraft
East Anglian Flying Services, Ltd.	Southend-Ostend ...	1.5.51-30.4.52 ...	D.H.89
	Southend-Shoreham-Jersey	5.5.51-31.3.53 ...	D.H.89
	Southend-Jersey	1.4.53-1.10.55 ...	D.H.89
	Rochester and Southend-Ostend	1.6.52-31.3.53 ...	D.H.89
Fingland's Airways, Ltd.	Manchester-Newquay	9.6.51-31.10.55 ...	Anson
Isle of Wight Flying Club, Ltd.	Sandown-Portsmouth-Southampton-Bournemouth-Sandown ...	1.2.51-31.1.56 ...	D.H.89 and Gemini
Lancashire Aircraft Corporation, Ltd.	Newcastle-Leeds-Southampton-Jersey ...	2.4.51-30.9.52 ...	DC-3, Consul, D.H.89 and D.H.86B.
	Birmingham-Isle of Man	9.7.51-1.4.56	
	Blackpool-Isle of Man ...	2.4.51-1.4.56	
	Leeds-(Blackpool)-Isle of Man	2.4.51-1.4.56	
	Newcastle-Carlisle-Isle of Man	2.4.51-30.9.55	
Manx Air Charters, Ltd.	Isle of Man-Carlisle ...	31.5.52-27.9.52 ...	D.H.89
Morton Air Services, Ltd.	Croydon-Guernsey Croydon-Jersey	13.6.52-13.9.52	D.H.89, Dove and Consul
	Bristol-Jersey/Guernsey	10.2.51-31.12.52 ...	
	Croydon-Le Touquet	1.6.52-28.9.52 ...	
Murray Chown Aviation, Ltd.	Cheltenham-Bournemouth-Jersey	2.6.51-30.9.55 ...	D.H.89
	Newquay-Scilly Isles ...	25.6.51-30.9.55 ...	D.H.89
Olley Air Service, Ltd.	Croydon-Jersey Croydon-Guernsey Croydon-Birmingham	13.6.52-13.9.52 For B.I.F., 1952	D.H.89, Dove and Consul
Scottish Airlines	Prestwick-Isle of Man...	1.6.51-30.9.55 ...	DC-3 and D.H.89
	Prestwick-Burtonwood-Northolt	1.6.51-31.5.52 ...	DC-3
	Aberdeen-Dundee-Edinburgh-Prestwick-Belfast	1.5.51-30.4.53 ...	DC-3
Silver City Airways, Ltd.	Lympne-Le Touquet ...	26.4.51-31.12.61 ...	Bristol 170
	Southampton-Cherbourg	10.1.52-31.12.61	
	Southend-Ostend ...	Easter 1952-31.3.53	
Starways, Ltd.	West Hartlepool-Jersey	1.6.52-14.9.52	DC-3, D.H.89 and Anson
	Isle of Man-Glasgow ...	31.5.52-31.3.53	
	Liverpool-Isle of Man	31.5.52-31.3.53	
Transair, Ltd.	Croydon-Jersey Croydon-Guernsey	14.6.52-13.9.52 ...	Anson

This table, showing agreements (excluding tours) recommended or approved up to mid-April, should be studied in relation to the Air Transport Advisory Council's review (see page 542) of operations by independent companies in association with the Corporations.

FROM THE CLUBS



WHAT AILS PRIVATE FLYING? : This impressive line-up at the Redhill Dawn Patrol (see paragraph below) seems to answer the question asked by the writer of an article under that title in "Flight" of April 18th. This, and a similar scene at Shoreham in the afternoon, is indicative of the enthusiasm which, in spite of discouragements, contrives to exist among members of Britain's flying clubs.

EXCELLENT weather prevailed throughout the Redhill Flying Club's first dawn patrol of the season, held on Sunday, April 20th. At 0840 hr, nine aircraft—three Magisters, a Moth Minor, two Austers, a Nighthawk, a Gemini, and a Messenger—took-off to defend their airfield. Shortly after 0900 the first of the 34 attackers was seen approaching the boundary. Here, as at Shoreham later in the day, the defence was good; only seven of the 34 managed to land without having their registration letters taken. Those qualifying for a free breakfast were : Mr. F. Darlow, in Mr. Haywood's Piper Cub, G-ALMA, from Broxbourne; Mr. Price, in one of Southend's Austers, G-AJEO; three of the Penguin Squadron from Gatwick, Mr. D. Cotter, Mrs. Y. Grace, and Mr. Sherman, flying Austers G-ALYD, G-AHKO, and G-AHSB respectively; Mr. Marriage, in a London Aeroplane Club Tiger Moth, G-AHIZ; and Mr. R. R. Carne, from Elstree, in Gemini G-AKEI. Other aircraft arrived from Panshanger, Croydon, White Waltham, Denham, Rochester, and Fairoaks.

Having patrolled the skies for some 30 minutes—doubtless looking for that now almost proverbial D.H. Dragon—the defenders found their thoughts inevitably turning towards food; so, having landed and parked alongside the already impressively long line-up of visiting aircraft (see photograph) they joined forces with the attackers and prepared to do justice to the excellent breakfast provided by the club.

IN conditions vastly improved as compared with those prevailing throughout the London Aeroplane Club's dawn patrol of the previous week, the Southern Aero Club of Shoreham staged its second flying event of the season, in the form of a tea patrol on April 20th.

With the weather very much in their favour, the club's machines took off shortly before 1500 hr to defend their respective sectors—a job well done, apparently, for of the 25 attacking aircraft only four managed to escape the eighteen eagle eyes of the defending pilots. The four successful attackers were : Mr. H. Turner, a private owner who arrived in his Proctor G-AIKJ from Croydon; Mr. H. R. Coxhead, in his Gemini G-AKHJ from White Waltham; Mr. H. Best-Devereux, the secretary of the Elstree Flying Club, flying a Piper Cub, G-ALGH; and Mr. Watson from Broxbourne, who arrived in Messenger G-AISL. The aircraft park produced evidence also of machines from Fairoaks, Southend, Lympne, Redhill, Panshanger, Denham, Eastleigh, Blackbushe, and Woodley.

Incorporated with the patrol was a time-of-arrival competition for which three prizes were awarded. The first prize, a handsome silver shield, was presented to Mr. Da Costa in Messenger G-ALAE; second and third prizes—copies of the new *R.Ae.C. Air Touring Guide*—went to Mr. H. R. Coxhead (who also won a free breakfast) and to Mr. E. Day in his Gemini G-AJKS.

After attackers and defenders alike had enjoyed a first-rate tea provided by the S.A.C., a height-judging competition was staged with the aid of Mr. E. W. Westbrook, who flew his Messenger across the airfield at 1,550ft. The winner was Mr. D. M. Crockford, whose guess was 1,560ft; the prize was £2 2s.

ON Sunday, May 11th, the Rochester Flying Club is holding a dawn patrol between 0900 and 0930 hr. Defending aircraft will be on patrol within one to three miles from the centre of the airfield, and the customary free breakfast will be the reward of those pilots who land without having their registration letters noted.

There will be a prize presented to the pilot of the aircraft which arrives from the farthest afield and another prize for the aircraft landing nearest to a sealed time between 0900 and 0930.

In addition to the patrol, the R.F.C. is organizing a navigation competition, to take place in the morning and occupy approximately an hour; it is open to all visiting aircraft. Competitors are asked to arm themselves with a ½ in : 1 mile map (Air Sheet 12) and a navigational computor, protractor, ruler and pencil. No entrance fee will be charged, and attractive prizes will be awarded to the winner. This event should provide good practice for intending entrants for the Auster-Ragosine Homing Trophy on May 25th.

NOW that dawn patrols and similar events are becoming more frequent as the summer approaches, certain of the rules pertaining to them might well be scrutinized. Although, primarily, dawn patrols are informal gatherings of flying club members, they have a recognized set of rules which should be complied with. We refer particularly to the "defence zone" limitation, which is not always being strictly observed.

Defenders should not, for example, "shoot down" attackers at any point on the circuit or on final approach, and they should also keep within a predetermined radius of the airfield. Whilst, as we have said, the spirit of a dawn patrol—or any other patrol—is one of friendly informality, some pilots understandably take a dim view of having their chances of a free breakfast jeopardized by unreasonable defensive action.

THE West London Trophy Air Race, to be held at White Waltham tomorrow, May 3rd, will be flown over a 24-mile course consisting of three laps of an eight-mile circuit. Eight vintage aircraft are to take part in this event, which is to be flown during the Vintage Aeroplane Club's rally. The machines and their pilots are : D.H. Cirrus Moth, G-EBLV (W/C. C. A. Pike, A.F.C.); Tipsy B, G-AFJS (M. J. Eddins); Avro Avian 4M, G-ABEE (Capt. A. Marshall); Tipsy B, G-AFSC (H. G. Davies); Avro Club Cadet, G-ACHP (D. F. Ogilvy); Hawker Tomtit, G-AFTA (S/Ldr. N. F. Duke, D.S.O., D.F.C., A.F.C.); Aeronca 100, G-AEVS (B. J. Snook); and Miles Nighthawk, G-AGWT (I. A. Forbes).

The V.A.C. Rally will begin with a time-of-arrival competition which will take place between 1100 and 1130 hr on Saturday morning, and numerous competitions, display items and demonstrations have been organized.

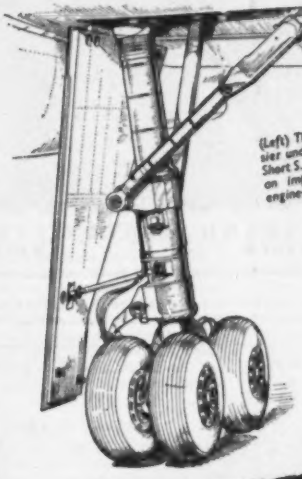
WITH the object of providing a pleasant introduction to the sport of gliding, the Scottish Gliding Union has organized regular summer training courses for beginners. The total cost, including training, temporary membership of the Club, insurance and accommodation, is £12 12s per week. This charge also covers the cost of using the machines and equipment.

Training procedure during the seven days is on the lines recommended by the British Gliding Association, all instruction being carried out on dual-control gliders, so that the average pupil is expected to gain both "A" and "B" certificates during the week. The Union's training site is situated near Loch Leven, in Kinrossshire.

There are four courses during the summer : from July 5th to 12th; July 19th to 26th; August 9th to 16th; and August 23rd to 30th. Application forms may be obtained from the course secretary, Scottish Gliding Union, 29 Barony Terrace, Edinburgh 12.

MESSIER *Landing Gear*

FROM FLIGHT AIRCRAFT ENGINEER SEPT. 21ST. 1951

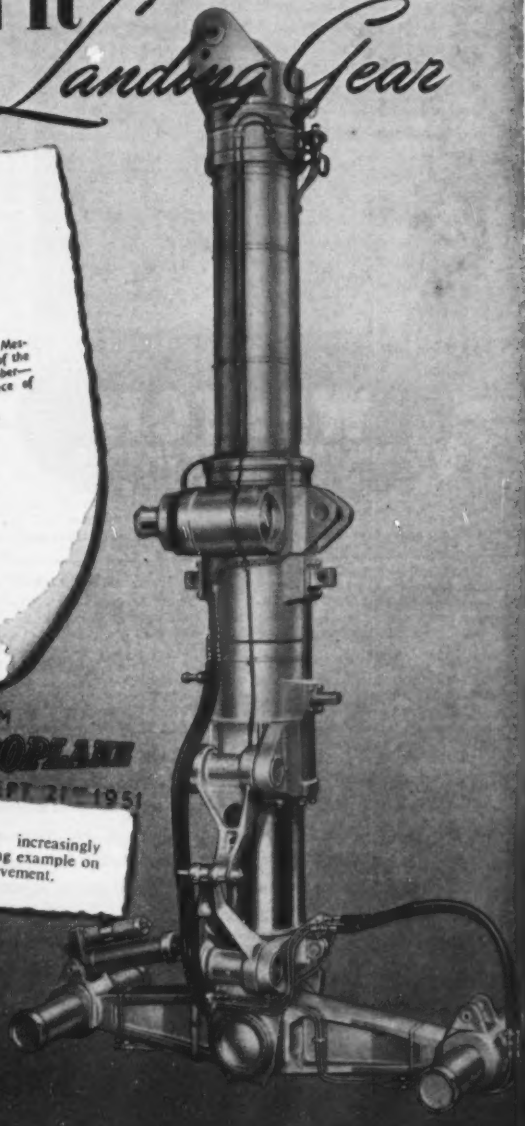


(Left) The towering Messier undercarriage of the Short S.A./4 jet bomber—an impressive piece of engineering.

FROM THE AEROPLANE SEPT. 21ST. 1951

Bogie-wheel undercarriages are becoming increasingly common at Farnborough, and the inward-retracting example on the Short SA.4 is a magnificent engineering achievement.

Twenty-three years experience in the design of hydraulic landing gear for aircraft is incorporated in every Messier undercarriage design.



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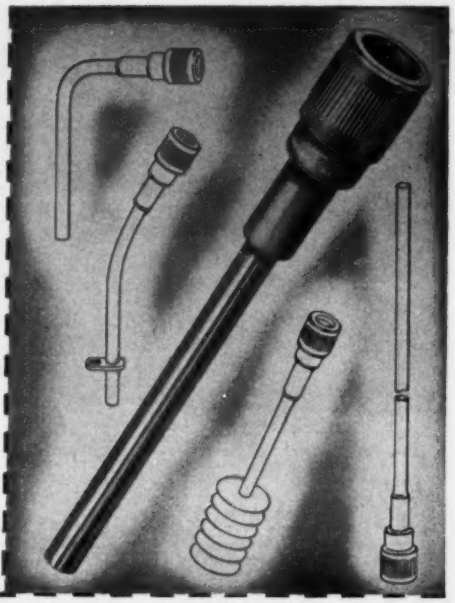

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SERVICE AVIATION

Royal Air Force and Naval Aviation News

MEETING AT FONTAINEBLEAU are seen Lt.-Gen. Norstad, Commander of the Atlantic Pact Air Forces in the Central Sector with (left) Air Marshal Sir Robert M. Foster, Commanding H.Q. 2nd Allied Tactical Air Force and Major-Gen. Dean C. Strother, U.S.A.F., Commanding H.Q. 4th Allied Tactical Air Force (see news item on this page).

New European Commands

GENERAL NORSTAD, Commander-in-Chief, Allied Air Forces Central Europe, announced on April 20th the formation of two Allied Tactical Air Forces for the defence of the West European approaches and the support of allied ground forces. The new formations are designated the 2nd Allied Tactical Air Force and the 4th Allied Tactical Air Force, and are in the northern and central sectors respectively.

The 2nd A.T.A.F. is under the command of Air Marshal Sir Robert Foster and comprises the 2nd British Tactical Air Force, the Netherlands Tactical Air Command, with Nos. 311 and 312 Squadrons of the Netherlands Air Force, and No. 2 Belgian Wing.

The 4th A.T.A.F. is under the command of Maj.-Gen. Dean C. Strother, U.S.A.F., and comprises the U.S. 12th Air Force, the French 1st Air Division, including Nos. 1, 2 and 3 Squadrons, a Royal Canadian Air Force Division, and several squadrons scheduled to arrive later in the year.

The commanders have been instructed to ensure that their command organizations are integrated to the greatest possible extent, and to develop training in accordance with the army formations they are intended to support.

Ground Defence Training

A POINTER to the form which any war of the immediate future is expected to take is evident in the new requirement that all R.A.F. officers, non-commissioned officers and airmen must attain specified standards of proficiency in ground-defence training. Basic knowledge of ground defence is to form part of the qualification for promotion for all ranks. It is intended to incorporate ground-defence work in the air exercises held during this coming summer.

Officers and airmen of the R.A.F. Regiment have been formed into mobile columns to supplement Army troops in operations against enemy paratroops.

To ensure the maintenance of effective defence schemes, station commanders are encouraged to visit the R.A.F. Regiment depot at Catterick, Yorkshire, where the latest defence developments and techniques are demonstrated.

Boyd Trophy Presentation

THE Flag Officer Air (Home), Vice-Admiral C. E. Lambe, is to present the Boyd Trophy to No. 814 Squadron at R.N.A.S., Lee-on-Solent, on May 7th. It will be received on behalf of the unit by Lt. Cdr. J. A. McColgan, R.N., at present commanding the squadron, which is expected to fly down from the newly re-opened naval air station at Machrihanish, for the ceremony.

The Boyd Trophy, which incorporates a silver model of a Fairey Swordfish, was presented to the Royal Navy by the Fairey Aviation Company to commemorate the work of Admiral Sir Denis W. Boyd, K.C.B., C.B.E., D.S.C., for naval aviation during the period 1939-45.

F.E.A.F Command

A CHANGE has been made in the appointment—announced recently in these pages—of the A.O.C.-in-C., Far East Air Force. Air Marshal Sir Francis J. Fogarty, K.B.E., C.B., D.F.C., A.F.C., was to have been succeeded by Air Marshal Sir Thomas M. Williams, K.C.B., O.B.E.; now, however, the latter's appointment has been cancelled because of ill health, and the command will go to A.V-M. A. C. Sanderson, C.B., C.B.E., D.F.C. With the acting rank of air marshal, he will take over his new duties almost immediately.

Lord Trenchard's U.S. Tour

AS we reported last week, Marshal of the Royal Air Force Viscount Trenchard is at present on a tour of Canada and the U.S.A. Accompanied by Lady Trenchard, he left England on April 15th in the R.C.A.F. Canadair C-5 in which Her Majesty the Queen (as Princess Elizabeth) and the Duke of Edinburgh travelled last year.

On April 22nd Lord Trenchard presented wings at a passing-out parade of 23 R.A.F. and R.C.A.F. cadets at No. 2 Navigation School, Winnipeg—the first to be held there since the war. He hopes to spend several days examining the potentialities of Alaska as an Air Force base, after which he will go to Washington, *via* Edmonton and Akron, Ohio.

R.A.F. Appointments

THE Air Ministry announces that A.V-M. C. N. H. Bilney, C.B., C.B.E., is to be vice-president of the Ordnance Board, Ministry of Supply, from July 1st, 1952, while A. Cdre. (acting A.V-M. C. E. H. Allen, C.B., D.F.C., B.A., M.I.Mech.E., is to be Director-General of Technical Services, Air Ministry, from

BY JET TO U.S.: On April 18th, Air Chief Marshal Sir Hugh P. Lloyd left Binbrook in a Canberra to fly to Offutt, Omaha, U.S.A. The flight was made via Keflavik, Goose Bay and Dorval. Sir Hugh, centre, is seen with S/L. E. Cassidy, left, who piloted the Canberra and F/L. P. A. G. Barlow, the navigator.

NORTH LUFFENHAM LINE-UP of F-86 Sabres of No. 1 Fighter Wing, R.C.A.F., for a visit from Air Marshal W. Curtis, C.B., C.B.E., D.S.C., Canadian Chief of Air Staff. After a fly past by Nos. 410 and 441 Squadrons a number of the pilots were introduced to the C.A.S. Seen in the group are, left to right, S/L. Larry Hall, O.C. No. 410 Squadron; S/L. J. MacKinnon, P.A. to the C.A.S.; Air Marshal Curtis; W/C. R. T. P. Davidson, Wing Operations Officer and acting C.O. in the absence of G/C. E. B. Hale; and F/L. Mike Doyle.

SERVICE AVIATION . . .

May 19, 1952, retaining his present rank.

A.V-M. Bilney has been Director-General of Technical Services at the Air Ministry since March, 1951, and was formerly at H.Q. Maintenance Command for two years as Air Officer in charge of Administration. From the outbreak of war in 1939 until December, 1940, he was at the A. and A.E.E., and was afterwards in the Directorate of Armament Development at M.A.P. until July, 1942, when he became Vice-President (Air) of the Ordnance Board. In 1944 he went to Bomber Command as Command Armament Officer and at the end of 1945 became A.O.C. No. 25 Group, Flying Training Command. From 1947 to 1949 he was at the Air Ministry as Director of Technical Training.

A.V-M. Allen was until recently S.T.S.O., Middle East Air Force, where he went in July, 1949, after being S.A.S.O., No. 43 Group, Maintenance Command, for nearly three years.

On the outbreak of the war he was at H.Q. Far East, on Engineer Staff duties. He transferred to the Technical Branch of the R.A.F. in April, 1940, and returned home to be Deputy Director of Repair and Maintenance at the Air Ministry. A few months later he was given command of Henlow, where he remained until early in 1943. Afterwards he commanded Cosford for three years before going to No. 43 Group.

A.V-M. Allen, who was born and educated in South Africa, enlisted in the R.F.C. in May, 1917, and was commissioned four months later.

R.N.Z.A.F. for M.E.A.F.

AS a result of the conference of defence ministers held last year at which Commonwealth defence was discussed in detail, the Prime Minister of New Zealand, Mr. Holland, has announced the forthcoming posting of No. 14 squadron R.N.Z.A.F. to reinforce the British garrison in the Middle East. The squadron—a fighter unit equipped with Vampires—will leave New Zealand in September; they will not take their present aircraft but will re-equip with Vampires on arrival in M.E.A.F.

New C.O. for 610 Squadron

THE Air Ministry has announced that S/L. J. E. Storrar, D.F.C., is to command No. 610 (County of Chester) Squadron, R.Aux.A.F.

S/L. Storrar originally took a short-service commission in April, 1939, and served with Nos. 145 and 73 before commanding Nos. 65 and 165 Squadrons. Later in the war he became Wing Leader at Biggin Hill and went from there to perform similar duties at Digby, Lincolnshire.

He left the Service in 1947 but joined No. 603 (City of Edinburgh) Squadron, R.Aux.A.F. in 1949.

EMBLAZONED with its squadron markings is this D.H. Chipmunk basic trainer of the Cambridge University Air Squadron, seen picketed out at Gatwick recently.

The C.A.A.S. in Korea

ON a visit to R.A.A.F. units in Japan and Korea, Air Marshal W. D. Hardman, the Australian Chief of Air Staff, left Melbourne by air on April 18th. He was due to confer with Gen. Ridgway, the U.N. Supreme Commander, Lt.-Gen. Weyland, Commanding General of the Far East U.S.A.F., and with the heads of the British and Australian missions in Tokyo.

Gliding Association Re-organized

AFTER two years' growth it has been found necessary to reorganize the R.A.F. Gliding and Soaring Association in order that its equipment and facilities may be made available to the greatest possible number of people and its expansion may continue on a sound basis.

The aim of the association is to bring gliding and soaring within reach of all members of the Service, and especially those normally employed on ground duties. It comprises all R.A.F. gliding and soaring clubs formed in the United Kingdom and similar R.A.F. clubs formed overseas may join as associate clubs.

So that the best use may be made of the funds and resources available the association has selected seven clubs to be known as area clubs, which units in the vicinity will be encouraged to join.

The seven selected clubs have their headquarters at the R.A.F. Stations at Compton Bassett, Wilts (where the club is known as the "Moonrakers"); Boscombe Down, Wilts; Watton, Norfolk; Scampton, Lincs.; Bridgnorth, Shropshire; Pitreavie Castle, Dunfermline, Fife (H.Q., No. 18 Group, Coastal Command, and of the Balado Gliding Club); and Middleton St. George, near Darlington.

Although only seven area clubs are contemplated at present, it is recognized that there are other clubs, the function of which is to provide gliding facilities for their own unit personnel or for certain special categories of personnel (such as the Royal Aircraft Establishment) as distinct from serving a wide area as area clubs do. These unit clubs will not be subsidized by the association but will be assisted in every other way possible. They will be known as associate clubs.

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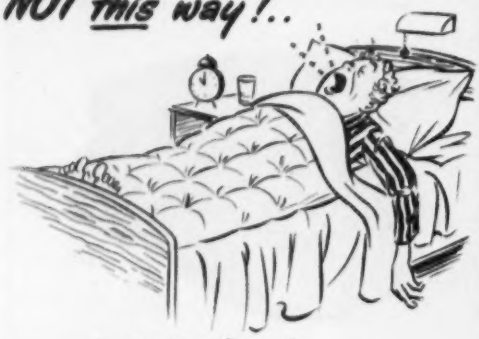

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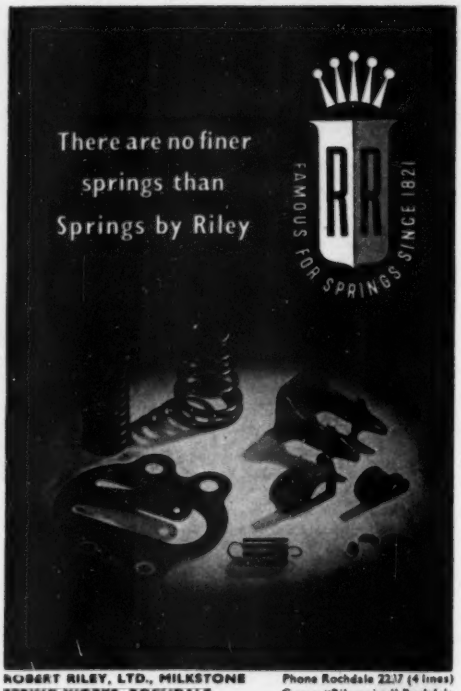

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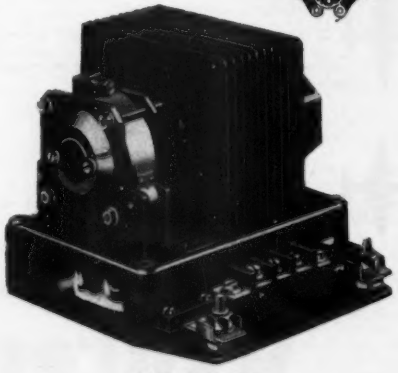

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Answers to crossword puzzle (April 18th issue)

Across.—1, Modification; 6, Spares; 8, A.R.B.; 9, Lurch; 11, Nanism; 13, Range; 15, Plate; 16, Yule; 18, End; 20, Ree; 23, Tide; 25, Master; 27, As; 29, Lama; 31, Ate; 32, No; 34, Wit; 36, Overhauls. *Down.*—1, Masonry; 2, Drain; 3, Feels; 4, Aircraft; 5, Our; 7, Sump; 10, Hat; 12, Inert; 14, Need; 17, Uva; 19, Neat; 21, Eel; 22, Era; 24, In; 25, Mono; 26, Sine; 28, Send; 30, Awl; 31, At; 33, Or; 35, Is.

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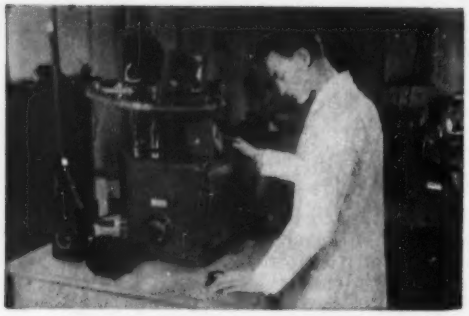

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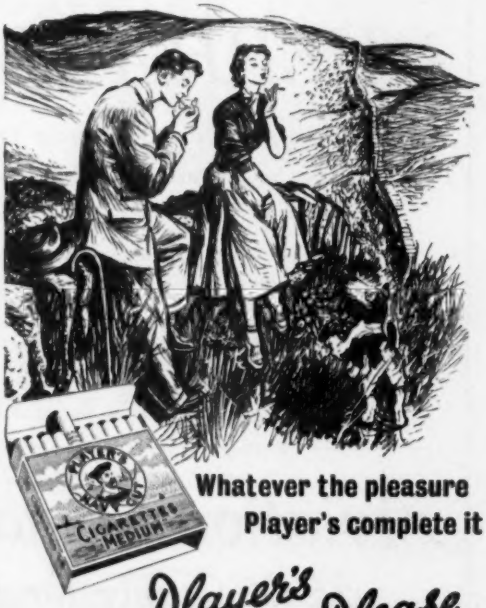

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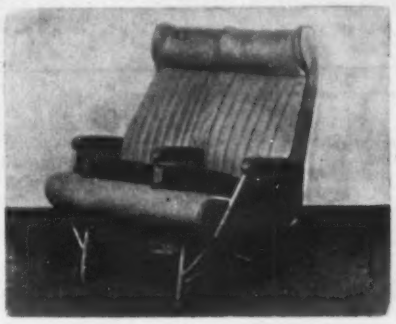

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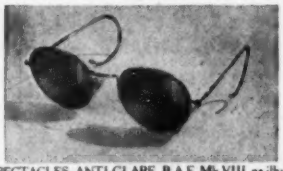

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JIG and tool draughtsmen required by Percival Aircraft, Ltd., Luton Airport, Beds, fully experienced.—Applications, in writing, to Manager, Ministry of Labour and National Service, Luton, Beds. [0060]

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WEIGHT estimator required by Percival Aircraft, Ltd., Luton Airport, Beds, for work on fixed wing and helicopter aircraft.—Apply, giving details of age, qualifications, experience and salary required, to: Ministry of Labour and National Service, Luton, Beds. [0062]

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JIG and tool draughtsmen, senior and junior, required for work on interesting projects. Pension scheme.—Apply to Ministry of Labour for submission to the Personnel Manager, The Fairey Aviation Co., Ltd., Hayes, Middlesex. [7944]

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ASSISTANT chief steersman required by Percival Aircraft, Ltd., Luton Airport, Beds.—Applications, giving full details of qualifications, experience, age and salary required, to the Manager, Ministry of Labour and National Service, Luton. [0068]

TECHNICAL authors and illustrators required by Percival Aircraft, Ltd., Luton Airport, Beds. Knowledge of M.o.S. procedure desirable.—Applications, in writing, stating age, experience and salary required to Manager, Ministry of Labour and National Service, Luton, Beds. [0064]

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SENIOR and junior technical assistants are required for experimental and development work on aircraft propulsion units. Candidates should have an engineering degree or its equivalent. Previous experience of this type of work is desirable but not essential.—Reply, giving details of qualifications and experience, to Reference SA8a, Armstrong Siddeley Motors, Ltd., Coventry. [9003]

AIRCRAFT weight engineers required by Saunders-Roe, Ltd., East Cowes, Isle of Wight. Seniors and juniors required for expansion of an enterprising department. Experienced men, and young men looking for an interesting career are invited to apply, giving details of experience, age, salary expected, etc., to the Cowes Office of the Ministry of Labour and National Service. [9007]

FLYING instructor required for private flying training school at Sywell. Applicants must have held C.F.S. Category and be on the R.A.F. Reserve, or be prepared to join.—Applications stating age, qualifications and details of experience should be made in writing to the Manager, Brooklands Aviation, Ltd., Sywell Aerodrome, Northampton. [9045]

DRAUGHTSMEN required for aircraft and armament drawing office of Saunders-Roe, Ltd., East Cowes, Isle of Wight. Senior men with aircraft experience and juniors with aircraft or engineering background are invited to apply, giving details of experience, age, salary expected, etc., to the Cowes Office of the Ministry of Labour and National Service. [7988]

IMPORTANT Midlands aircraft engine manufacturer has vacancies for a number of designers and senior and junior draughtsmen. The work is connected with gas turbine engines. Although experience is most desirous it is not necessarily essential, as training will be given.—Apply in some detail, please, to Armstrong Siddeley Motors, Ltd., Reference 16f, Coventry. [9018]

AIR FORCES (naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen, and stressmen for work on this interesting programme.—Write, giving details of experience and salary required, to Manager, Ministry of Labour and National Service, Luton, Beds. [9048]

APPLICATIONS are invited from senior and intermediate design draughtsmen. Experience of aero-engine design desirable, but not essential. Also checkers.—Please write, stating age and giving details of previous experience in chronological order to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [9050]

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines. Applications should state full particulars of experience and qualifications and should be addressed to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [9052]

A TECHNICAL writer required by firm in N.W. London area manufacturing aircraft electrical equipment. Applicants must have concise style and be capable of compiling technical specifications from data or drawings. Electrical knowledge essential. The position is superannuated and gives considerable scope to an ambitious man with adequate experience.—Write, stating experience, age and salary required to Box 8052. [8055]

NORMALAIR, Ltd., require for their London Office, a first-class design and detail draughtsman, experienced in light mechanical precision engineering or instrument practice and with aircraft background, for aircraft pressurising and high altitude breathing equipment. Good working conditions and superannuation.—Apply stating age, experience qualifications and salary required to Employment Exchange (N.A.), Yeovil, Somerset. [7909]

SENIOR production engineering draughtsman required with considerable experience in design of plastic moulding dies and also of injection machines and hydraulic machinery for expanding application of new processes entailing wide variety of engineering problems. Good prospects. Pension scheme.—Apply to Ministry of Labour for submission to The Personnel Manager, The Fairey Aviation Co., Ltd., Hayes, Middx. [9020]

SENIOR technical assistant required for the Service Department of The de Havilland Engine Co., Ltd., preferably with experience on reciprocating and gas-turbine engines. Suitable applicant will be required to work on headquarters' staff of the Service Department at Leavesden Aerodrome, near Watford, Herts.—Apply in writing, stating age, qualifications and salary required, to the Personnel Officer, The de Havilland Engine Co., Ltd., Leavesden Aerodrome, nr. Watford, Herts. [7948]

EXPERIMENTAL department of engine manufacturers in Home Counties requires engineer with Higher National Certificate or degree, having basic knowledge of electronic circuits and practical familiarity with electrical instrument for measuring pressure, strain, vibration, etc. Experience desirable in use and construction of electronic equipment for engine development.—Apply to Employment Exchange, stating age, experience, salary required. [9039]

TOOLROOM foreman. A toolroom foreman is required by firm in the west of Scotland engaged in the light engineering industry. Applications are invited from qualified persons with a sound engineering background. A wide knowledge of jig and tool design and the ability to control staff are essential. The appointment will carry an attractive salary and is covered by Contributory Pension Scheme.—Applications, stating age and full details of experience will be treated in strict confidence, address to Box 8042. [9040]

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Senior Captain First Class
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DUBLIN AIRPORT

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The latest date for receiving completed Application Forms will be May 23rd. 1952.

SITUATIONS VACANT

A. V. ROE and Co., Ltd., have vacancies for technicians in the wind tunnel section of their aircraft research division at Woodford Aerodrome, Cheshire. Applications are invited from suitably qualified personnel, preference being given to candidates having previous wind tunnel experience.—Applications, stating full particulars of age, qualifications and experience should be made through an Employment Exchange or a Scheduled Agency and addressed to the Labour Manager, A. V. Roe and Co., Ltd., Greengate, Middleton, Manchester. [7976]

ROLLS-ROYCE, Ltd., Glasgow, require senior and junior technical assistants for work on technical production and quality engineering. Applicants should have engineering degree or equivalent with previous experience in a similar type of work. Salary will be in accordance with experience and qualifications. Prospects of advancement good.—Applications should be made in writing to the Personnel Manager, Rolls-Royce, Ltd., Hillington, Glasgow, S.W.2, giving full particulars of experience, qualifications, etc. [7986]

A DEVELOPMENT engineer who has specialised in the design of airborne receivers is required by Marconi's Wireless Telegraph Co., Ltd., Chelmsford, to take charge of a section. An attractive salary will be offered to a suitable applicant who must have had good development experience in this field. The position is one of responsibility and is pensionable.—Please, without delay, write in confidence giving full details and quoting reference SSA to Central Personnel Services, English Electric Co., Ltd., 36-39, Gillingham Street, London, S.W.1. [9047]

PROCESS engineer required in connection with production of complex high tensile steel components. Must be capable of design, development and layout of new plant. Preferred experience would include production engineering of aircraft fittings, application of high frequency heating, steel foundry plant, materials-handling equipment. Applicants should have served apprenticeship in mechanical engineering and qualified to H.N.C. standard.—Apply to Ministry of Labour for submission to The Personnel Manager, The Fairey Aviation Co., Ltd., Hayes, Middx. [9049]

YOUNG engineer required to help start and eventually take over a section for test and development work on profile or gas-operated motors. Applicants should have attained at least Higher National Certificate standard. Previous experience with cordite systems and similar units, such as starter motors and a knowledge of test bed procedure is desirable.—Applications stating age, experience and qualifications should be sent to the Chief Designer, British Messier, Ltd., Cheltenham Road East, Gloucester. (Terms of Notification of Vacancies Order, 1952 apply to this advertisement.) [9044]

BRITISH OVERSEAS AIRWAYS CORPORATION have a vacancies for two flight simulator instructors (pilot) for duties near London Airport. Instructors are required to give basic and applied four-engine instrument instruction in connection with initial and refresher pilot training. Candidates should have experience as pilot on modern four-engined aircraft as flying instructor, and a capacity for organisation. The salary for the posts will be within a range from £700 to £1,000 per annum.—Applications, in writing, should be made to the Chief Personnel Officer, British Overseas Airways Corporation, Airways House, Great West Road, Brentford. [9041]

BRITISH OVERSEAS AIRWAYS CORPORATION have a vacancy for a flight simulator instructor (engineer) for duties near London Airport. The instructor will be responsible for the operation of the engineer's panel of the Boeing 377 flight simulator. Candidates must possess good technical knowledge of the functioning and operating characteristics and techniques of aircraft, engines and all aircraft systems applicable to modern commercial aircraft, and have had at least five years' aircraft engineering experience. The salary for the post will be within a range from £700 to £700 per annum.—Applications, in writing, should be made to the Chief Personnel Officer, British Overseas Airways Corporation, Airways House, Great West Road, Brentford. [9043]

BRITISH OVERSEAS AIRWAYS CORPORATION invite applications for the position of Flying Instructor to be stationed near London Airport. The duties include instrument flying instruction covering applied Instrument Flying on Radio Ranges, I.L.S. and A.D.F.; conversion of single engine aircraft pilots to Consolidated Coronado aircraft; and staff pilot duties.—Applicants must have Commercial Pilot's Licence, with current Instrument Rating; sound knowledge of I.L.S., Radio Ranges and A.D.F., with instruction experience and instructor's endorsement, or the ability to obtain this. Salary £950-£1,150 p.a., according to experience and qualifications.—Applications in writing should be submitted to the Chief Personnel Officer, B.O.A.C., Airways House, Great West Road, Brentford, Middlesex. [9042]

SITUATIONS WANTED

LICENSED engineer, A.B.C.X. Responsible and administration qualifications. South preferred.—Box 8031. [9038]

AIR O.P. PILOT (31). Private Pilot's Licence. Approx. 600 hours, mainly Austers. Keen to make career as civil pilot. Any offer of employment, or advice, welcomed. —Box 8044. [9004]

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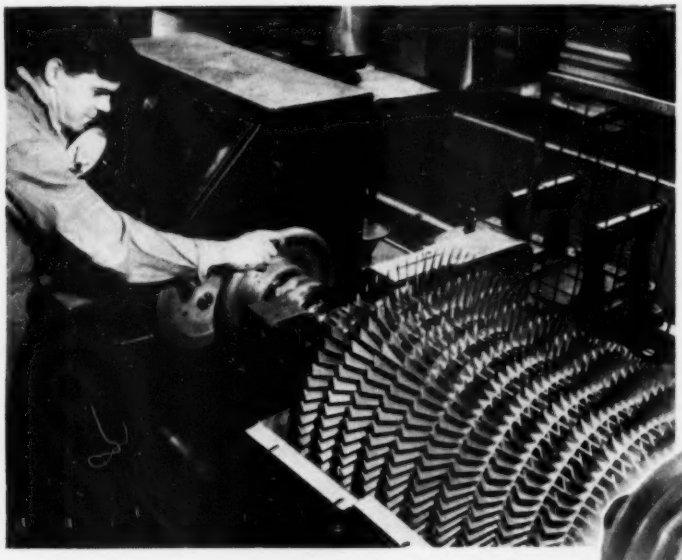
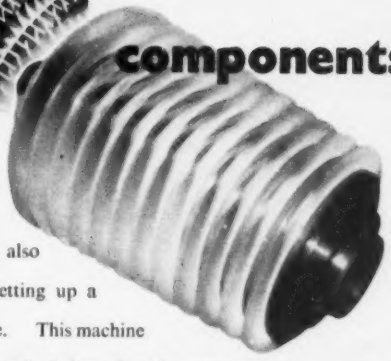
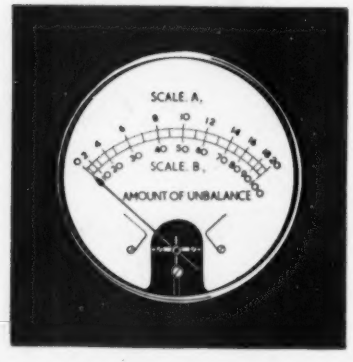


Dynamic balancing of rotating components



To minimise vibration and reduce bearing loads at the high speeds employed in turbine engines, it is not sufficient for rotating components to be simply in static balance, they must also be dynamically balanced. The operator in the illustration is setting up a Proteus compressor rotor on a "Gisholt" dynamic balancing machine. This machine rotates the component to be balanced, and measures the bearing reactions at each end of the rotor. Electronic equipment determines the magnitude and location of any out-of-balance forces, so that they may be eliminated, either by adding or removing metal at the appropriate positions. All the major rotating components of "Bristol" turbine engines are dynamically balanced before assembly into the engine. The machine illustrated is one of many similar balancing machines used in the "Bristol" workshops.



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